September 1963

Agriculture

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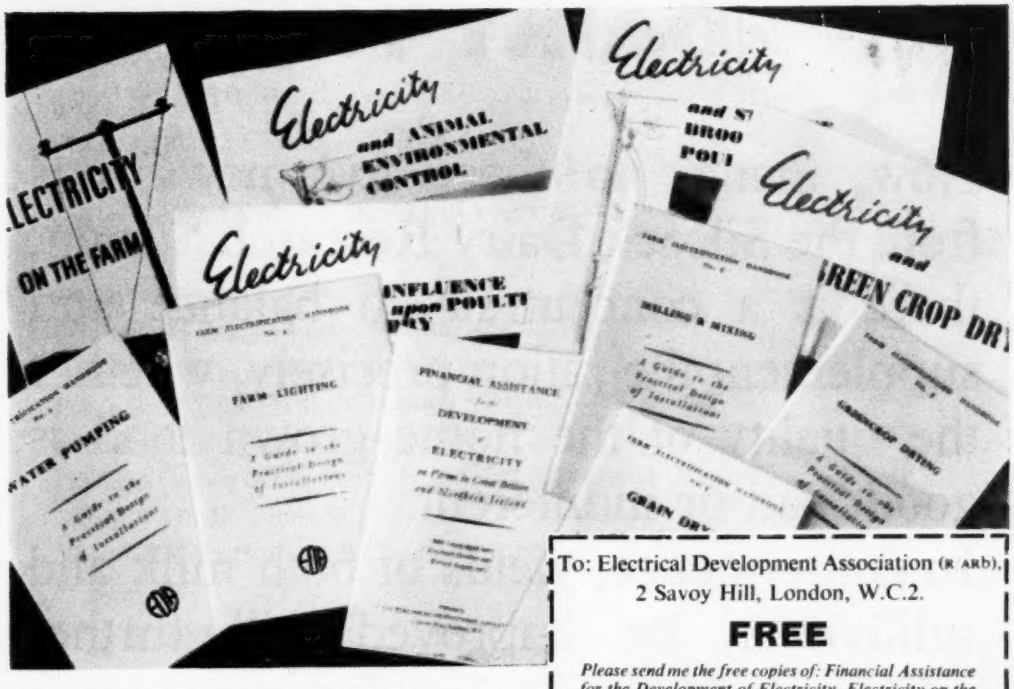

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Agriculture

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Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1. Trafalgar 7711

CONTENTS

PAVED AREAS

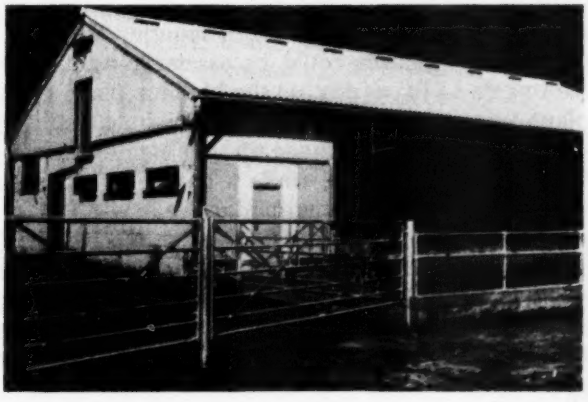
To minimize pollution problems, open, paved areas around the farmstead to which cattle have access should be kept to the minimum consistent with good farm management. But where they are necessary certain points are worth keeping in mind.

It is most important, for example, to prevent standing water which, besides requiring labour to get it away, is likely to cause injury to man and beast in frosty weather. Yards and paths should have adequate falls to a convenient outlet so that all liquid, whether clean or polluted, can drain away as quickly as possible; a reasonable gradient is 3 in. in 10 ft, provided the surface is rough enough to prevent slipping.

Concrete gives the best and most trouble-free surface, but sometimes, if the soil is self-draining, a well-rammed base of hardcore, gravel or clinker will suffice—except that the removal of solid manure may tend to break up the surface although the liquid may have drained through.

Gratings and gulleys are quickly blocked by solid manure, especially if it contains straw or other rubbish. All drainage from yards should remain visible until reaching the point of discharge. If it is hidden it gets forgotten and blocked drains are the result. Be sure that gullies and silt traps are suitable for their purpose.

The rate at which water runs off a surface depends on the rainfall intensity and the permeability, roughness and slope of the surface. A figure of 2 in. per hour is a fair average run-off from roofs, yards, roads and other impervious surfaces served by a drain. But naturally, this figure would have to be increased in areas of heavy rainfall.



Clean, tidy and hygienic

BEEF

Winter Feeding to a Policy

T. L. J. Lawrence • *J. Pearce*

A VERY large number of beef cattle originate as autumn- and/or winter-born calves from dairy herds. To meet market requirements they should finish at two years old, or under, weighing between 8 and 10 cwt. The yearling winter period is a crucial stage for such cattle, and the problem is one of deciding what levels of feeding are desirable on the assumption that the cattle will be turned out to grass in the following spring. This is of great importance when it is realized that the level of winter feeding can have a considerable bearing on subsequent performance at grass and the benefit that these cattle can derive from this cheaper source of food.

To obtain more precise information on this problem, we started an experiment at the University of Reading in the winter of 1959–60, using Sussex × Dairy Shorthorn steers.*

Winter feeding experiment at Reading

Thirty-six steers, averaging 10 months old, were divided into three groups and put into yards on the 20th October, having spent the previous summer at grass. Each group was fed on a different plane of nutrition, and animals were individually fed and rationed. All animals were weighed weekly and seven body measurements taken monthly so that rate of gain and conformation development could be assessed. Animals on the High plane were fed to gain 1½ lb per day, on the Medium plane ¾ lb per day, and on the Low plane to gain no live weight for the whole feeding period of 168 days.

The rations were so made up that maintenance requirements were met by feeding hay and silage, while a concentrates mixture of 5 parts of rolled barley to 1 part of dec. groundnut cake was fed for the required liveweight gain. Thus animals on the Low plane received hay and silage only.

*An account of the rearing of these cattle is in the issue of *Agriculture* for September, 1961, where some observations on the early-weaning system were made. A complete account of the whole experiment will, it is understood, shortly be published in the *Journal of Agricultural Science*.

TABLE 1

Liveweight gains and food consumption per animal for the winter period of 168 days

	High	*Medium*	*Low*
	lb	*lb*	*lb*
Initial live weight	494	492	492
Liveweight gain	271	124	5
Gain per day	1·61	0·74	0·03
Hay consumed—total	502	503	508
,, ,, per day	2·9	3·0	3·0
Silage ,, total	3,630	3,206	3,302
,, ,, per day	21·6	19·1	19·7
Concentrates—total	1,161	512	0
,, per day	6·9	3·0	0

The effects of these levels of feeding on width, depth and girth were quite marked. Height measurements were not so greatly affected. Compared with the High group beasts, those in the Medium and Low groups were narrower and shallower in relation to their height.

The coats of the animals in the High group were sleek and glossy, compared with the longer, rougher and coarser coats of the other two groups, which were more reminiscent of outwintered beasts. None of the lower levels of feeding affected the general health and vitality of the animals.

The following summer

In the first week of April following the winter feeding, all animals were turned to grass. Their progress is shown below:

TABLE 2

Liveweight changes per animal during the first five months at grass

	High	*Medium*	*Low*
	lb	*lb*	*lb*
Initial live weight	765	616	497
Summer gain—5 months	176	303	370
Change in wt. during first 4 days at grass	− 28·3	− 9·5	+ 2·4
Change in wt. during second 4 days at grass	+ 4·2	+ 20·1	+ 27·9
Gain per day— 1st month	0·6	2·8	4·1
,, ,, ,, 2nd ,,	2·0	3·1	3·3
,, ,, ,, 3rd ,,	1·3	2·1	2·6
,, ,, ,, 4th ,,	0·5	0·6	0·9
,, ,, ,, 5th ,,	1·9	2·1	2·3
,, ,, ,, whole period	1·3	2·2	2·6

The loss of weight on turning out to grass was severe in the High group, but we think this was largely due to a loss in gut-fill. Nevertheless, the better gains exhibited by the Low and Medium groups at this early stage were maintained throughout the summer. By the end of five months, therefore, the Low group had reduced their initial disadvantage, compared with the High group, from 266 lb to only 72 lb, showing the ability of cattle of this age to compensate for a previously restricted diet. The recovery in body conformation was even more marked. In fact, after five months at grass it was virtually impossible to pick out by eye animals from any of the winter levels of feeding which had been imposed.

Finishing for slaughter

Animals of all groups were sent for slaughter at a standard weight of 9¼ cwt. Some of the animals on the High and Medium levels of feeding were slaughtered from grass, but most of the animals were brought back into

A pen of Sussex × Shorthorn steers on the winter feeding experiment

yards and put on to a ration designed to give a liveweight gain of approximately 2¼ lb per day. At slaughter, live weights and carcass weights were recorded, and one side of each animal was jointed to assess carcass quality.

TABLE 3

Live weights and carcass weights per animal at slaughter

	High	*Medium*	*Low*
Live weight at slaughter (*lb*)	1,045	1,043	1,042
Dressed carcass weights (*lb*)	604	598	599
Dressing-out per cent (full gut)	57·8	57·4	57·5
" " " (empty gut)	68·6	68·5	68·5
Age at slaughter (*weeks*)	104	107	113

From the evaluation of the carcasses there were no practical significant differences between animals from any of the three levels of winter feeding. The most marked difference was in the age of slaughter, but again this was not great. In addition, all carcasses were graded 'A' with the exception of three (one from each treatment group). To the butcher handling the carcasses, no differences were discernible.

Practical implications

It is obvious from this investigation that if the growth of the beef animal is retarded at the yearling stage, then neither are the subsequent powers of recovery impaired nor is the quality of the carcass affected. It would be a mistake to assume from this, however, that retardation of growth in order to economize on winter feeding to take advantage of cheap grazing is necessarily always the correct policy to adopt.

Perhaps the most important practical implication of this work is that if yearling beef cattle are to be urned out to good grass in the spring, then

high levels of feeding in the previous winter are wasteful. If a high level of feeding is to be adopted, then this can only be justified if the animal is finished in the yard and not turned out to grass. The position then becomes clear. Yearling animals intended for subsequent summer grazing to be finished on grass or later in yards should receive rations in their first winter of yarding capable of allowing a gain of about $\frac{3}{4}$ lb per day. This should be achieved on good quality roughages, with little or no concentrate feeding. On the other hand, animals intended to be finished in their yearling winter must come into yards at a sufficiently good weight (not less than 6 cwt) and be fed at a level capable of achieving gains of 2 lb or more per day.

A positive feeding policy

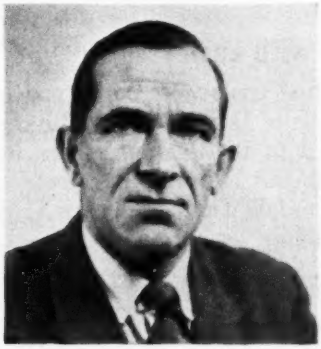
By a better understanding of the effects of the level of feeding during the winter on the subsequent performance, producers can adopt a more positive approach to beef production and select the system of feeding most suited to the circumstances of their farms. On many farms where beef cattle are reared, there is often considerable variation in individual weights at the yearling stage.

By weighing it should be possible to select those animals (say 6 cwt or over) capable of fattening during the winter on a high plane of feeding. Those animals of less than, say, 6 cwt are perhaps best suited to a lower and cheaper level of feeding and finished later on grass.

The animals fed on a high plane will come for slaughter in the period from March to May when beef prices tend to be at their best, thus offsetting the more costly feeding. Animals fattened on grass will come for slaughter from August to October when beef prices are lower, but these cattle will have been fed more cheaply and will finish at higher weights.

The adoption of either or both systems of beef production depends on circumstances on the farm and on movements in costs and prices. Nevertheless, it seems reasonable to suggest that beef producers should take stock of their cattle at the beginning of the winter period and adopt a positive feeding policy.

T. L. J. Lawrence, M.Sc., B.Sc., is Assistant to Mr. J. Willett at Manor Farm, Bishopstone, Sussex. He was previously Research Assistant at the University of Reading's Upperwood Farm.



John Pearce, Ph.D., N.D.A., N.D.D., is Director of Sonning and Upperwood Farms, and is Lecturer in Agriculture at the University of Reading.

From the NORFOLK AGRICULTURAL STATION come details of increased yields for cereals sown at 3½-inch row widths

Closer Drilling of Cereals

J. H. Baldwin

WHAT is the best row width for cereals is not a new problem, but interest has revived in it recently because of the introduction of several makes of drill capable of drilling rows closer together. It is claimed that a substantial increase in yields may be expected when narrow rows are used, but farmers and advisers are anxious to know if this claim is substantiated by experimental work.

The Norfolk Agricultural Station has carried out six trial series dealing directly with this question. The results are worth examining in some detail, since they give an accurate idea of the increases it is possible to obtain by drilling cereals in close-spaced rows.

Trials with barley

The first trials were concerned with Spratt Archer barley and compared 7 inch with 3½ inch drill widths. A report on the first four years' results appeared in the *Journal of the Royal Agricultural Society* for 1931, and although this is over thirty years ago, they cast a very useful light on this subject today. The table below shows the yields from these trials in cwt per acre (drilling was at 1·3 cwt per acre until 1934, then at 2 cwt per acre).

	1927	*1928*	*1929*	*1930*	*1931*	*1934*	*Mean*
7 in. rows	21·2	25·6	18·4	15·3	20·0	23·6	20·6
3½ in. ,,	22·7	27·4	19·5	17·0	20·9	24·0	21·9

The yields from the narrower rows were on average 1·3 cwt per acre, or about 6 per cent above those from the 7 inch rows, and this benefit from the 3½ inch spacing was remarkably consistent from year to year. There appeared to be no difference in the malting quality of the grain from the two different treatments, and from ear counts and 1000-corn weights it was deduced that

the increase in yield from the narrow rows was due to an increased size of ear, and not to a greater number of ears or to a bigger grain size.

Further trials were carried out in 1938 and 1939. Both were with Spratt Archer, but comparing row widths of 4 inches and 6 inches in the first year, and 4 inches and 8 inches in the second. There was a slightly higher yield from the wider rows in 1938, but this result was exceptional and in 1939 the 8 inch rows gave only 29·7 cwt per acre as opposed to 30·4 cwt per acre from the 4 inch rows—a result more in line with the previous experiments.

No further work on barley was done until 1962, when it was felt that the results from the early trials could no longer be held to be strictly applicable to modern varieties subjected to much higher fertilizer dressings. So we started a trial series on Proctor and a new mildew-resistant variety not yet on the market. The row widths were 8 and 4 inches, and nitrogen levels of 40, 60 and 80 units per acre were also included.

Only one year's results are as yet available, but they do show a highly significant difference of 1·6 cwt per acre in favour of the narrower rows for both varieties. Though it is unwise to put too much emphasis on a single year's work, it is worth noting the close agreement with results from the earliest trials on barley.

Winter wheat at three widths

Between 1931 and 1933 Squarehead's Master winter wheat was drilled on 10, 7, and 3½ inch rows, and, though in the first season the 7 inch rows out-yielded the narrowest by one cwt per acre, in the remaining two years there was on average 0·9 cwt per acre in favour of the 3½ inch rows. In all three years the 10 inch rows gave the lowest yields.

A trial using Hybrid 46 was carried out between 1952 and 1955 which compared 4, 8 and 12 inch rows. The table below summarizes the results:

Yield of Grain (*cwt/acre*)	*1952*	*1953*	*1954*	*1955*	*Mean*
4 in. rows	44·0	43·8	47·7	39·8	43·8
8 in. "	41·6	42·4	44·9	40·1	42·2
12 in. "	39·5	40·7	42·3	38·9	40·4

This series showed that there was a strong trend towards higher yields from reduced row widths, with 4 inch rows producing about 4 per cent more grain than 8 inch rows, and 12 inch rows about 4 per cent less. The trial also included a seed rate comparison, and although it is often argued that a different quantity of seed should be sown when the coulter spacing is reduced, there was no indication that the rate per acre should be any different for narrow rows than that regarded as optimum in normal farming practice.

Three levels of nitrogen were superimposed on the row width treatments. There was an interesting parallel with results from the 1962 barley trial, in that there was a trend towards better utilization of nitrogen by the more uniformly spaced plants in the narrowest rows.

Atle comparable

Spring wheat is not popular in Norfolk, but when the variety Atle came along, it looked sufficiently attractive to justify trials on various husbandry problems connected with it, among them investigations into row widths. In work continued from 1954 to 1956 Atle was drilled at 1·4 cwt per acre on either 4 or 8 inch rows, and it was found that on average the former produced

Drilling spring barley

25·9 cwt of grain and the latter 24·8 cwt per acre. This increase of 1·1 cwt per acre by using narrow rows is equivalent to a 4 per cent improvement over the 8 inch rows and is therefore comparable to that in the winter wheat trials.

Spring oats

The results of only one series of trials are available for spring oats, and this covers the period 1931 to 1935. The variety was Golden Rain in all except the last year of the experiment, when Victory was substituted; and since the seed rates varied from year to year, they are included in the following table of grain and straw yields.

	1931	*1932*	*1933*	*1934*	*1935*	*Mean*
Seed rate (*cwt/acre*)	1·3	1·3	1·1	1·5	1·6	
Yield of grain (*cwt/acre*)						
7 in. rows	28·3	32·1	28·3	28·2	26·0	28·6
3½ in. "	27·8	31·5	28·9	31·6	26·6	29·3
Yield of straw (*cwt/acre*)						
7 in. rows	30·0	25·1	31·5	25·5	25·0	27·5
3½ in. "	31·1	25·9	36·0	28·8	23·7	29·1

The overall increase in the yield of grain when the oats were drilled on narrow rows was only 2 per cent, but there was a substantial increase in the weight of straw. This must be a reflection of a difference in the growth habits of oats, as compared with that of the other two cereals. In the only barley trial where straw yields were recorded the weight was rather smaller from the narrower rows, while the improvements in grain yields of barley and wheat were both greater than that of oats when grown on close spacings.

Strong case for narrower drilling

The obvious conclusion to be drawn from these trials is that if a row width of 7 or 8 inches for cereals is halved, there will be a small increase in yield in almost every season. The objection could be made that these results are not absolutely relevant to the farmer who is thinking of changing a cereal

drill with coulters spaced at 7 inches for a new one drilling at perhaps 4½ or 5 inches, but it seems reasonable to assume that, though the increases in yields may not be the full 4 per cent for wheat or 6 per cent for barley which were obtained in the experiments, there will nevertheless be a small gain—say perhaps 3 per cent. This improvement in yield would be at no extra cost in seed, fertilizers, or manpower. The only extra expenditure would be in replacing the drill.

It is tempting to leave the subject at this point, but it is as well to consider possible snags that may be met by reducing row widths. To begin with, why is the present 7 inch spacing so commonly used? There must have been good reasons in the past for choosing this particular distance.

In the last century farmers grew wheat on 12 inch rows because they were obliged to use Jethro Tull's horse-hoeing system to control weeds, and when this practice became no longer economic, row widths were in fact reduced to 7 or 8 inches. They might have been reduced even more but the extra draught caused by introducing more coulters would have been a serious objection to the use of closer rows when horses were still the major source of power on the farm. Now tractors are universally used this limitation to the use of narrow row drills has of course been removed.

There may be difficulties when using close spaced coulters in drilling on a cloddy autumn seedbed or where trash is present on a dirty field. But these troubles can largely be overcome if the two ranks of coulters are well staggered, and this is a point well worth looking for in buying a new drill.

Modern herbicides have of course greatly reduced the need for controlling weeds by cultivations, but it is worth noting that cereals on close spaced rows may have more smothering action than those on wider rows. This could be of use in wild oat control, as this weed appears to be very susceptible to vigorous crop competition.

The case for using a drill with close spaced coulters on farms with a large acreage of wheat and barley appears to be strong. If we assume an overall increase in yields of 5 per cent on these cereals, this will amount to an extra £2 per acre on a crop fetching an overall price of about £40 per acre. On a hundred acres of cereals or more the cost of a new drill would therefore soon be covered. Farmers with small acreages of wheat and barley who already have a sound drill will obviously not find it worth while making a change, but for the large arable farms narrow row cereal drilling is a sound proposition.

The author, **John H. Baldwin, B.Sc., Dip. Agric.**, left Reading University in 1956 and worked at the Norfolk Agricultural Station for a year before joining the National Agricultural Advisory Service. He returned to the Station on secondment as Field Trials Supervisor where he has been concerned entirely with experimental work on arable crops.

Brian Hanson
Central Veterinary Laboratory

Looking after your Birds

2. Dealing with Disease

BEARING in mind that all kinds of livestock require constant attention, one of the disadvantages of labour-saving equipment is that it tends to distract attention from the well-being of the flock and to reduce the frequent contact which enables the first signs of trouble to be recognized. A good deal of stockmanship and judgment may be needed to assess whether trouble is brewing, unless there is a drop in food consumption, general signs of ill-health, or a sudden increase in mortality. It is a good maxim to regard any disease as infectious until the contrary is established. When trouble is suspected the following steps are suggested.

First check that nothing has gone wrong with the food and water supply or, where applicable, the heating arrangements. If vague respiratory symptoms are evident it is advisable to increase the ventilation if this can be done without reducing the temperature too much. Of course, the potential danger of spreading possible airborne infections must be considered. Next remove any dead birds and get a diagnosis. Isolate the suspected houses. A separate attendant is desirable, but if this is not possible the birds concerned should be left till last, so that personal disinfection may be carried out after contact with them. It is inadvisable to start any treatment until a tentative diagnosis is available, and make no alterations in the diet or introduce any further changes which might increase stress. Be careful how you dispose of carcasses; remove them from the house under cover, using paper bags or something similarly destructible. An incinerator or carcass disposal pit is an essential part of any plant.

Routine disinfection

With all forms of intensive husbandry, a certain amount of routine disinfection between each change of stock is essential to prevent exposing relatively susceptible birds to an environment which has become contaminated to a greater or lesser degree. After an outbreak of infectious disease this routine disinfection must, of course, be especially thorough. There are many forms of disinfectant available.

Broadly speaking, any disinfectant should possess the following properties. It should be easily available, relatively cheap and safe to use without risk of damaging the material to which it is applied. It should be stable in water, active in the presence of organic matter, effective over as wide a range of infectious agents as possible, and should have a solvent action on grease.

If a disinfectant is to be fully effective certain physical factors must be taken into consideration. Infectious agents are present in organic matter, faeces, dust and litter, so the disinfectant must be able to get where its action is required. It is necessary, therefore, to combine the process of disinfection with thorough cleaning. Follow the instructions given with the disinfectant. Make sure that the recommended strength is used, for solutions which are too weak are useless. Over-strong solutions, on the other hand, are wasteful and possibly dangerous. The action of many disinfectants is enhanced by an increase in temperature, so in some cases it is necessary to maintain the solution at a certain temperature if it is to be effective. Clean water should always be used—preferably soft water. Allow sufficient time for the disinfectant to act; whilst most organisms are destroyed in a comparatively short time, complete sterilization needs a longer period of action.

Air sprays

Sprays and aerosols have become increasingly popular in recent years to reduce the risk of spreading airborne diseases. Infections of this type are heavier where the atmosphere is dusty, and it follows therefore that air disinfection is more likely to be effective where the dust content of the air is low. To be really successful and prevent the spread of disease from house to house, air disinfectants must be used in association with other methods of control. They are of limited use in controlling the spread of infection between birds in the same house, since there is ample opportunity for the disease to spread by direct contact. This last point does not apply to the same extent to batteries. In these and in hatcheries or an empty building air disinfection may be of considerable value. Preparations are available which can be used to immobilize dust and are useful adjuncts to other forms of disinfection.

Procedure after infectious disease

The procedure following an outbreak of an infectious disease falls into three main stages. Firstly, a preliminary disinfection should be carried out as soon as possible to reduce the amount of actual infection present and the risk of spread. Disinfectant is applied over all surfaces before the litter or droppings are removed. If this is done thoroughly, a pause is permissible until the second stage can be started.

The second stage is the cleaning process and must be done with care. All litter and droppings should be removed and destroyed, preferably by burning. If the floors are of earth, the top three inches should be removed and the fresh surface flamed or soaked with disinfectant or a formalin solution made up by adding 1 pint of formaldehyde to 12 gallons of water. The floor should then be left for a week—possibly longer in some cases. All equipment should be dismantled, scraped, scrubbed and disinfected with some suitable fluid such as 4 per cent solution of soda in hot water, or concentrated hypochlorite with detergent. The dust from the roof, beams and walls must be removed, and for this purpose any means which will facilitate

thorough cleaning should be adopted—for example, live steam. The aim is to get rid of all organic matter which may hold infection and to prepare the buildings for the final disinfection.

When cleaning is completed all surfaces are finally disinfected. In small houses, spraying with disinfectant may be adequate; in larger buildings this may be augmented by fumigation or aerosols. The buildings are then left for a week or more, depending on what infection was previously present and to a certain extent on atmospheric conditions. Where clinical disease has not been present, this procedure can be modified for use between changes of stock.

High production, increased efficiency and low labour costs are important considerations when planning a poultry enterprise. But, if precautions against disease are not included in the plan, these aims will be difficult to attain.

EAST RIDING INSTITUTE OF AGRICULTURE

35 lb gain in ten weeks by *ad lib.* concentrates and a little hay

Grain-finished Lamb

D. Hurst
K. P. Riley

DURING the past two years we have finished more than four hundred lambs at the East Riding Institute of Agriculture on *ad lib.* concentrate rations plus a little hay. Several different breeds and crosses have been used, but Downcross lambs have done best. Only healthy, sound lambs are chosen for intensive feeding.

In the beginning

Lambs should be introduced carefully to *ad lib.* feeding, otherwise severe losses will occur from bloat, acetonaemia and pulpy kidney disease. We had some losses at first, and now adopt the following system of getting lambs

on to full feeding. They are all vaccinated twice before housing with 2 c.c. of pulpy kidney vaccine, allowing a 7–10 day interval between each vaccination. The concentrates to be fed *ad lib.* when the lambs have been housed are introduced whilst they are still at pasture. Up to 1½ lb per head per day should be consumed before the lambs are housed. Immediately this is done, hay should be offered *ad lib.* for the first seven days and then reduced to only ½ lb per head per day by the end of the second week of housing. The concentrates should be increased gradually, so that by the end of the second week of housing they are being offered *ad lib.* from self-feed hoppers.

Dr. T. R. Preston has introduced a ration consisting of a high proportion of oats and oat husks, and this has been fed by a number of farmers whilst getting store lambs and cattle on to *ad lib.* feeding. Where this fibrous ration is fed as a change-over ration prior to *ad lib.* feeding, it should be given for three weeks and no hay need be offered.

Change-over Ration

	cwt
Undecorticated cotton cake	5
Rolled oats	3
Rolled barley	4
Oat husks	6
Molasses (for cubes)	1½
or	
Molassine meal	
	lb
Ground chalk	14
Steamed bone flour	14
Salt	14

No elaborate housing

Five to six square feet of floor area is required per lamb. They may be bedded on shavings, straw or sawdust. Housing on slats, however, is cleaner and keeps their feet in better trim. The slats need to be 2 feet clear of the ground for a 10–12 week feeding period. It is essential to have clean, fresh water available all the time.

The housing need not be elaborate. We have used Dutch barns, lean-to sheds, and wooden houses formerly devoted to chicken or turkey rearing. Old cart-sheds, broiler houses and stone barns can also be readily adapted. Good ventilation is the most important factor. There should be a good flow of fresh air all the time without direct draughts.

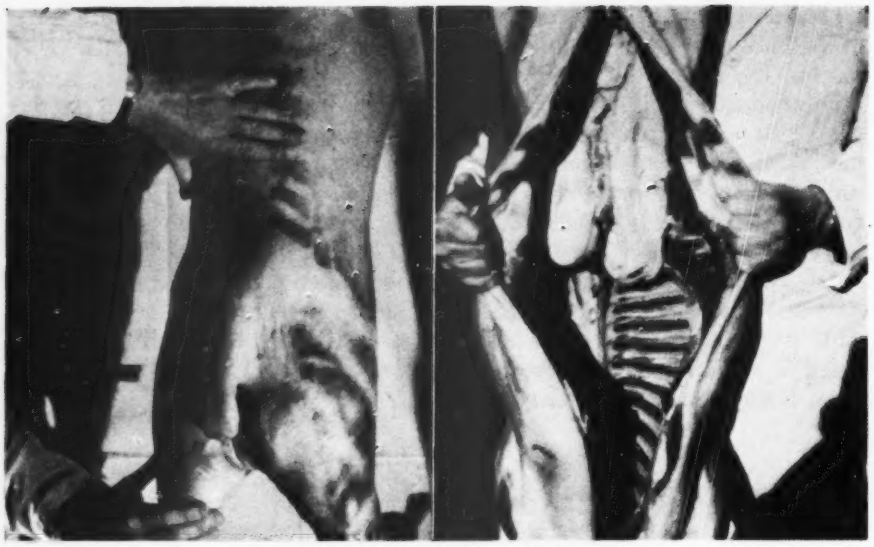
Implanting wether lambs with one tablet or 15 mg of hexoestrol as soon after housing as possible has resulted in 15–20 per cent increase in rate of gain and a similar efficiency in rate of gain, as compared with non-implanted wether lambs.

No economic advantage has been shown by shearing lambs in the autumn. Lambs first housed in early March and shorn may gain faster and leave slightly more profit. We have not, however, tried housing lambs from March onwards.

Type of feed

Rations similar to that introduced by Dr. Preston for intensively fed cattle have been successful. Equally good results have also been obtained where oats and maize replaced some portion of the barley.

A recent series of trials has shown that the best ratio of S.E. : P.E. is 6 : 1. Cube and meal rations have also been compared, and it was found that lambs gained faster on cube rations. But the cubes were more than £4 per



These close-ups of a carcass show (left) good finish of the leg, loin and rump and (right) the feathering on the ribs and the not excessive fat covering over the kidneys

ton dearer than comparable meal rations, and at this price they were not economically justified. Had the price difference been only £3 per ton, then there would have been a slight advantage from feeding cubes.

Rations Used

1. 8½ parts Rolled barley
   1½ ,, Protein, vitamin, mineral pellet

2. 4 parts Cracked maize
   2 ,, Rolled oats
   2½ ,, Rolled barley
   1½ ,, Protein, vitamin, mineral pellet

3. 2½ parts Cracked maize
   6 ,, Rolled barley
   1½ ,, Protein, vitamin, mineral pellet

Hazards

Pulpy kidney and bloat have been our chief hazards. Both these problems have been overcome by double vaccination and always feeding ½ lb of hay per day, as indicated earlier.

We have had only two cases of urinary calculi or 'water belly'. Affected lambs find difficulty in passing urine, frequently strain and arch their backs. Veterinary treatments are available but rarely worthwhile. From our experience, lambs showing symptoms of urinary calculi should be slaughtered and the carcass salvaged.

Margin over feed cost

The food conversion ratio and the cost of the ration (i.e., the cost per lb of 'meat gain') is the most important factor with any intensive feeding system. Sound, healthy lambs have averaged 4–5 lb liveweight gain per week, with food conversion ratios of between 5 and 6 : 1. Thus 10–12 lb of food is required to put on 1 lb of 'meat'. From the margin over feed cost determination table, given below, it will be seen that when a ration costs £24 per ton, or 2½*d.* per lb and the food conversion ratio is 5·5 : 1,

the cost per lb of 'meat gain' is 2*s.* 3½*d.* The margin over feed cost can then readily be worked out by deducting the cost of 1 lb of 'meat gain' figure from the ruling value per lb of lamb.

Margin over Feed Cost

Cost of ration per ton	Cost per lb	Conversion ratio—cost per lb 'carcass' gain											
		4 : 1		4·5 : 1		5 : 1		5·5 : 1		6 : 1		6·5 : 1		7 : 1	
£	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
20	2	1	4	1	6	1	8	1	10	2	0	2	2	2	4
22	2¼	1	6	1	8¼	1	10½	2	0¾	2	3	2	5¼	2	7½
24	2½	1	8	1	10½	2	1	2	3½	2	6	2	8½	2	11
26	2¾	1	10	2	0¾	2	3½	2	6¼	2	9	2	11¾	3	2½
28	3	2	0	2	3	2	6	2	9	3	0	3	3	3	6
30	3¼	2	2	2	5¼	2	8½	2	11¼	3	3	3	6¼	3	9½

To find the margin over feed cost, take the cost per lb 'carcass' gain from the ruling carcass value per lb

Note: This table is based on a killing-out percentage of 50.

Most of the lambs which we have had on trials have been fed during the late summer and early autumn months. They have rarely been below 70 lb live weight at the beginning of the feeding period, and the average rate of gain was over 35 lb in ten weeks.

When the system should be worthwhile

There are a number of circumstances under which intensive feeding could have a place in a farming system:

1. Where an upland or hill farmer is left with a high proportion of store wether and surplus ewe lambs. The lambs could be retained, housed and finished, thus making the farmer independent of the very variable autumn store market.

2. A lowland grass farmer could house weaned lambs not previously sold fat off their mothers, finish them quickly and again be independent of the store market.

3. An arable farmer who may have surplus by-products such as sugar-beet tops or clover aftermaths and undersown stubbles could buy store lambs during the 'cheap' summer period. The lambs could be housed in late November and in 8–10 weeks reach good marketable weights with good finish, thus taking advantage of the gradually improving price for 'lamb'.

Stratford Story

Clyde Higgs

NOTHING very remarkable has happened on my farming way. Mostly it has been hard, enjoyable work with excursions into innovations, some discarded in infancy, others developed into useful maturity. The initial 250 acres, intended as a final unit, were bought from a city tycoon who found weekend farming with beef and corn too expensive, even when income tax favoured the industry. Quietly, as neighbours decided that farming before the 1947 Act was too chancy, the holding grew tenfold and, by luck or intuition, is in a ring fence, except for a gap caused by the village of Snitterfield and the main and minor roads which ease the transport problem—something like two-thirds of twelve tractors' time is spent in cartage.

Once upon a time, when brontosauruses roamed, this land must have been beneath a mighty River Avon, now little more than a wide stream but invaluable for irrigation. The soils range over sand, gravel, intractable marl and clay. An average annual rainfall of 24 inches demands timely operations. This season, following the Arctic conditions earlier on, has been very kindly, ensuring good grain crops and splendid takes of direct-sown grass seeds to provide 'spring' grazing in the late summer and autumn.

Yards and buildings

An agglomeration of this kind, where a dozen farms are welded into one with central management, poses farmstead problems. Economists rightly maintain that there are many savings to be gleaned from larger units, and certainly my outfit would be well served by three or four strategically placed centres designed and built in keeping with present-day needs while flexible enough to be useful in changing times. As things are, outdated buildings, erected in the spacious days when labour costs were unimportant, have been adapted. The original cattle yard shelter, for example, was walled in to make an inconvenient, though up-to-date, cowshed; now it is the office. But the buildings remain far below the standard of the new structures.

Near the core is a modern layout—a drier with ample 'loafing' room for wet grain which, when the cleaning and drying is finished, travels automatically to a multi-purpose building capable of holding 800 tons in a heap. This is moved by bulk lorry regularly throughout the season to level out selling prices. Next is a Dutch barn, filled with fodder in autumn to protect the 120-cow covered yard. A 250-ton vertical silo is emptied mechanically from the top and into the distributing auger. The portable bail stands on a concrete mat for five months every year, after ranging the fields where the grass is greenest for the other seven. So far, the place is free of cow cubicles, for farmyard muck, albeit a problem in storage, transport and distribution, is treasured for use on the arable in association with lime, nitrogen, potash and phosphate applied as food for growing crops or as dictated by helpful N.A.A.S. analyses.

There are four other covered yards adjoining existing farmsteads to accommodate about 400 in-milk and dry cows. Calf-rearing by early weaning methods is centralized at one farm, and here the animals stay until ready for outside life in summer and yarding in winter, when all cattle are housed.

Operational centre

Operations are directed from the main office, which houses essential records of workers, animals and crops. Employees render time-sheets ending on Sundays, so those who wish can draw subs. on Tuesdays. Wages are cleared every fourth Tuesday, when statements giving full details of deductions and holidays to come are shown. In spite of wages well over Board rates, few are sufficiently well-breeched to rely on four-weekly payments.

The history of any animal can be traced from cards carrying a mark corresponding to that in the ear; dates of vaccinations, service, milk records and breeding, are all shown. Pedigree was dropped when the bottom fell out of the market and official milk recording was discontinued, because it didn't help sales. Nevertheless, weekly figures are kept and used in rationing and assessing an animal's production value. Milk from the bails is checked daily with that processed in the dairy; the variation over a long period is about half of one per cent.

All milk is pasteurized under close official scrutiny. The myth that it is possible to supply raw milk to give customers continued satisfaction was exploded long ago; if the job is done properly there is no detectable difference. There are also the meagre records necessary for 3,000 purchasers on the token system. Once this entailed a lot of clerical work to cope with up-to-date week*ly* accounts (even more for the delinquents!). Now housewives buy discs ahead of their needs, so we have the cash before delivering the milk. There is a mountain of coupons in connection with cheap and free milk. We producer-retailers are a fading industry. Two-thirds of us have vanished in the past ten years, swallowed up where profitable by the swelling combines. The remainder continue to give a service often in sparsely populated areas with high distribution costs.

There are field records, too, which show the history of every enclosure, its cultivations and harvests. And what a varied pattern they make! *Rye Field:* hungry gravel, but if well fed will produce most crops, as it did rye this year for early bite when the larder was empty. *Poverty Piece:* just that, and no amount of attention raises it to normal. *Sixty-Five Acre:* of easy-working level soil, now in a bumper ley. *The Big Meadow:* an intractable riverside

A portable milking bail in use at Stratford during the summer

enclosure, yet handy for irrigation. *Black Ground:* turns up that colour; only a hard winter like the last prepares it for five-year reseeding. Short leys are giving way to longer ones, and indeed some of the banks are going down for good. Well fed and cared for, permanent pastures will produce just as economically as temporaries, but to maintain the thousand acres of arable in good fettle calls for regular breaks in the grain rotation. Short leys do this best by providing fodder and fertility at the same time.

Simplification

Streamlined farming has developed imperceptibly. Gone are the 150 acres of maincrop potatoes we used to have five years ago. They swelled the turnover but often left a narrow margin under our casual marketing methods. The same goes also for the sprouts and lettuce, with their unpredictable sales. Oats have been replaced by barley, as being just as good cow feed and more reliable. There is no finicky lucerne. Mangolds, still a hand job, have given way to silage. Pigs, on a very unorganized basis, have disappeared.

With this simplification, workers have dropped by a quarter and now look like this: Manager and assistant, arable and cattle foremen, twelve cowboys (two for each of five bails and two spares to ensure proper time off). There are plenty of instances of more cows to fewer men, but it's a hard life and better conditions produce better results. Then there are 20 tractor drivers and general farm workers, most of them interchangeable; one mechanic who, in spite of up-to-date machinery, is very fully occupied; two lorry drivers; two estate workers more than busy in trying to keep up the tied houses and farm buildings; and one part-time poultry girl. On the retailing side there are a dairy foreman, four assistants, 12 milk salesmen, again with spares, and one mechanic who regularly services the hard-worked delivery fleet.

Cropping has also been simplified. I now have 900 acres of wheat and barley; the maximum amount of winter wheat is sown under favourable

conditions, and barley (following the 100 acres of kale) fills any gaps. This smaller acreage is the result of sprays against flea beetle and fat hen. About 1,000 acres of temporary leys, with some permanent grass, make up the total.

Sixty per cent dairying . . .

Dairying has always been the backbone of the enterprise. It provides 60 per cent of the turnover. Five hundred Ayrshire cows and heifers average 870 gallons. A modest figure? Yes, but a sound one under the conditions. The herd is self-contained. New blood comes in by way of artificial insemination, and the bulls have one month on and two months off duty. Some are progeny-tested, but there is difficulty in keeping them in good trim until their daughters can be assessed. Only calves from the best dams are kept, the remainder go into pies; for attempts to make money by beef cross-breds, either as stores or finished beasts, failed. Home-grown food is used as far as possible, but the fetish of the cake bag lingers, so grain is sold to be collected by the next lorry. The farm was one of the first to produce Certified Milk and later to be attested. Blood testing controlled contagious abortion; S.19 has eradicated it. Mastitis remains the most difficult problem.

. . . plus sheep and poultry

A flock of Cluns was introduced, theoretically as scavengers, but in reality they demand the best of everything! Now numbering 500 ewes (the limit), the lambs meet a steady market at the local butchers. But alas, the appalling winter seriously affected the average, although there will be enough to make a useful profit and provide replacements.

A controlled environment poultry house was over-enthusiastically designed to save labour. Everything is automatic — air flow, temperature, feeding, watering and egg collection. The girl needs only three hours a day to tend 5,000 birds. But there are difficulties. The house is too wide, so the birds

'Loafing' space for wet grain near the drier

will not travel to the nest boxes; 10 per cent prefer to lay on the wire-mesh floor, which itself is unsatisfactory. A complete reorganization, including two-thirds deep litter floor with feeding and watering on a raised slatted platform and nest boxes, within laying distance, should make a first-class job. There is a strong retail demand for eggs.

Grass—controlled and conserved

There is nothing special about the management of the arable land, except that operations are better done sooner than later. Grazing is controlled everywhere by electric fences, grass is conserved as silage in towers, or pits, cheap and slightly wasteful. Immediately after cutting, nitrogen is applied and very quickly the sward is ready for grazing or hay. The latter is made by crimping, turning and baling—not, to my mind, as good as the old fork-and-rick methods, but the best substitute. A new fitting enables the mower and crimper to work together, so doing away with one tractor. Silage is handled by buck-rake, forage harvester or, for the towers, by expensive cutter blowers and a horde of tractors. I have doubts whether this Americanized process is worth the candle, but we must wait and see.

A range of traditional machinery includes a twenty-year old crawler, still equal to clearing unwanted hedges to make all fields about the optimum twenty acres, and a three-furrow reversible plough which does splendid work and reduces the need for subsequent cultivations. A forty-foot spray boom means that one machine can get round at the right time. To irrigation from the river, we have added a reservoir outfit. Each is capable of dealing with 100 acres and the results on grass only are well worthwhile.

The future? There is a possibility of increasing output, but our greatest efforts must be devoted to widening the gap between costs and selling prices —so easy to write, so difficult to do, with ever-rising, uncontrollable expenses.

It is with great regret that we have to record that **Mr. Clyde Higgs** died in July this year. Very well known throughout the farming world, and a contributor to this Journal over many years, he was a member of the Council of the British Dairy Farmers Association, and of the Bath and West and Southern Counties Agricultural Society. He was Chairman of the Agricultural Advisory Committee of the B.B.C. from 1955 to 1959, and a former Council member of the R.A.S.E. Besides farming 2,500 acres in Warwickshire, he was Managing Director of English Farms in Wiltshire, which comprises 4,500 acres.

Focus on Fruit

EAST MALLING RESEARCH STATION

Some points in their Annual Report for 1962

price 17s. 6d. from the Station

Six degrees of frost were recorded at East Malling on 1st May, 1962. Apples were then at the pink bud stage, but fortunately the buds had been hardened by earlier cold weather and were not therefore seriously affected. Most apples, except Bramley's Seedling, are more susceptible to frost injury at the fruitlet stage. A second, and more severe frost (temp. 28°F)—the latest damaging spring frost ever recorded at East Malling—occurred on 3rd June, when the fruitlets were swelling. Many were killed and much of the subsequent fruits (apple and pear) were cracked and blemished. Shoots growing from budded rootstocks were weakened and snapped off, particularly Cox's Orange Pippin.

Experiments have been carried out to test the effect of gibberellic acid on the fruit development of frost-damaged Conference pears. One application, between the green cluster and fruitlet stages, even ten weeks after frost damage, stimulated the production of marketable seedless fruits. The decision whether or not to spray should be postponed until full bloom, when frost damage can best be assessed. Post-blossom sprays may reduce fruit-bud formation for the following year and are therefore not recommended.

Complete control of codling moth can be achieved by three sprays of azinphos-methyl. Even when the third spray was omitted, the effectiveness was only slightly reduced. The same chemical also gave a satisfactory control of red spider mite.

Black currants

Turning to black currants, conspicuous malformation of the leaves was found to be associated with the presence of black currant gall mites in the affected shoots. These symptoms are a convenient indication of the presence of mites during the summer months. Other experiments at East Malling showed that the chlorotic vein pattern of black currant leaves that occurs in many localities is a preliminary phase of reversion disease.

When 'big bud' is seen on black currants, it is usually assumed that the virus reversion is also present, but this is not always true. Field observations show no close relation between the incidence of swollen buds and reversion. This virus is now known to occur as different strains, some so mild that they may easily escape detection.

Strawberries

In a three-year trial with nine commercial strawberry varieties on a site previously occupied by potatoes infected with Verticillium wilt, the varieties Cambridge Favourite, Cambridge Premier, Merton Princess, Royal Sovereign, and Talisman were found to be the most resistant. Cambridge Vigour and Cambridge Rearguard were the worst affected, while in Huxley's Giant and Mme. Lefebvre the disease showed large seasonal variations. The diseased plants cropped very badly.

Arabis mosaic is a soil-borne virus disease which can be serious on strawberry plants. Provided the nematodes carrying this virus are present, such a soil is a potential danger to any future strawberry crops that might be planted on that site. Of 45 strawberry varieties tested against arabis mosaic by planting them in infected soil, all but four proved to be susceptible. The dagger nematode, *Xiphenema diversicaudatum*, was identified in England in 1959 and shown to be a vector of arabis mosaic. Now another dagger nematode has been discovered which has many characters in common with a species found in the U.S.A. (*X. americanum*) and is known to transmit two viruses occurring there. Studies are being made to see if this nematode can transmit any of the viruses occurring in England.

Magnesium deficiency in apples

Soil treatments with Epsom salts to correct magnesium deficiency in apples have shown little benefit at East Malling, either on leaf symptoms or on growth, notwithstanding that analyses after the treatments showed magnesium to be available in the top layers of the soil. Foliar sprays, however, were more effective, although it has to be said that such improvement may not always be of economic value.

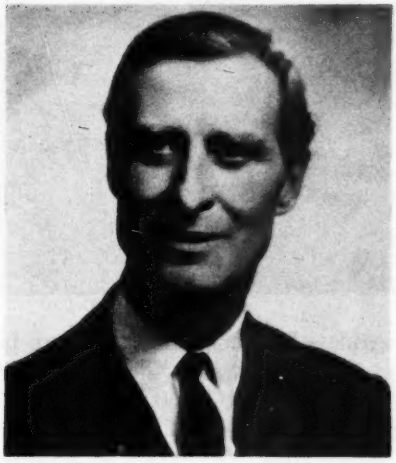
Little is yet known about how the minerals in foliar sprays enter the leaf. Some salts remain as a solution on the leaf surface and others dry out quickly. The salts can pass readily into the leaf only while the leaves bear a wet deposit. Magnesium chloride is more useful for these studies than magnesium sulphate (Epsom salts) because deposits of the chloride remain longer in solution on the leaf surface. The amount of magnesium which enters the leaf is, therefore, greater from a solution of the chloride than from one of the sulphate of equal strength. Only part of the available magnesium passes readily into the leaves on the day they are treated, even though they remain covered with a wet deposit. Further magnesium may, however, be taken up during the night. Thus there is initially a limit to the quantity taken up, but this limit appears to vary in different experiments. Studies are in progress to find out the reasons for these variations and why further magnesium is not taken up.

Pollinating insects

Very little information exists on the relative efficiency of bees, beetles and flies as pollinating agents of fruit blossom, but some observations at East Malling suggest, so far anyway, that a single bumble bee covers more trees and flowers in one flight than does a solitary bee or honey bee. The bumble bee is probably a more efficient pollinator than other wild bees, and these, in turn, may be more effective than honey bees. The discovery of air-borne apple pollen raises the possibility that insects may not be so important in pollination as is usually believed.

GRADE A BEEF FROM
GRASS AND MAIZE SILAGE

Peter Oldfield



Beef under Covered Yards

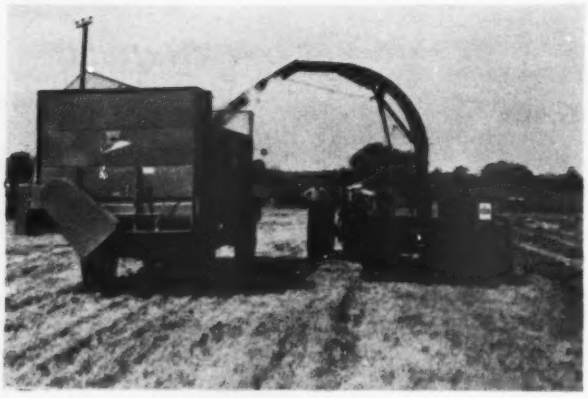
MANY factors control the growth-rate of fattening steers, including the level of feeding, the ratio of concentrates to roughage, the addition of fats, the type of cattle, the standard of stockmanship and the type of housing. Except for those who benefit from the Hill Farming Subsidy, it is difficult to make a profit in single-suckled calf rearing. Therefore, I decided to buy in cattle during October and November and to sell out before 1st May.

I most favour Beef Shorthorn × Angus dams crossed with a Hereford Bull. The compact sort are good doers, but the coarser types make the weight. The top class of animals are too expensive, and it is not advisable to pay more than £8 a cwt for them—they should not weigh less than 5½–6 cwt when bought, with a view to selling at 8–9 cwt. We sort out the animals into similar weights when they are put into the yards, and they are then disturbed as little as possible. They should be kept quiet and fed by the same man, and not changed from yard to yard.

When calves are purchased they are either put straight into the yards or, if bought early, turned out to grass and fed rolled barley for a week or two. Within a month of being put in the yard, they are all weighed, numbered and clipped down the back and treated for lice. Those that require it are dosed for worms. The feet are also carefully inspected.

Layout of yards

To handle the animals, we have eight yards, converted by farm labour from old barns, implement sheds and cowsheds, by using sleepers and second-hand material. The approximate cost is £32 per beast. The floors are of



On route to tower silo by a self-unloading lorry

insulated concrete (no bedding), laid to a gradient of 1 in 6 in. to a central channel underneath the manger, which connects to a main 9 in. drain. This has a fall of 1 in 60 and passes through all the yards collecting the dung and conveying it to the storage tank of 22,000 gallons. The mangers are 18 inches above the floor and approximately 5 ft wide. The buildings are constructed mainly of timber, with timber or corrugated iron roofs. We ensure they are draught-proof, and the temperature constant at approximately 50°F. Although the animals like to lie in a warm place, the feeding area need not be so comfortable. The space per animal in the yard is on average about 25 sq. ft. The frontage to the manger need not be more than some 6 inches per animal, provided they are fed to appetite.

For those interested, the yard areas and stocking are:

Area of yards	*No. of cattle*	*Sq. ft*
A	80	2,540
B	80	2,436
C	50	1,400
D	50	1,400
E	60	1,610
F	50	1,512
G	100	3,087
H	150	5,242
TOTAL	620	

There is a rather complicated sorting and weighing system which enables one man to select a few animals for inspection in a crush. He can also transfer them from any one yard to another or put the animals through a foot bath and spray for lice. Each yard has its isolation box for observation of any animal which doesn't seem to be thriving.

We grow only grass and maize on my farm of 160 acres in Berkshire. The aim is a 60–70 per cent dry matter silage preserved in tower silos, for feeding during the winter months only, to 600 single-suckled steers.

There are five silos of various kinds and sizes on the farm. They should be airtight and need no annual maintenance. At the moment we find it necessary to add 3–8 lb of barley a day to the silage, but in due course, when I have learnt to make my high dry matter silage containing a perfect fattening ration, I hope the cattle will be fattened economically without any grain supplements. I have installed a Harvestore, in which grain can be stored at a 20–30 per cent moisture content.

Except for ventilation, the yards are completely covered in. The concrete floors are washed down daily with a high-pressure irrigation pump. The dung

and water mixture passes through drains to outside tanks, whence it is irrigated two or three times a week on to the land—most of which is flat. The alluvial soil has a gravel subsoil.

Grass and maize

Our aim is to conserve as much grass as possible at the most suitable stage of growth—before ear emergence. Poor grass silage of low digestibility is detrimental to the fattening steer and even spoils the animals' appetites. It is important that the leys should be so arranged that the towers can usually be filled before the end of June. It is possible, however, to go on to the end of July in the case of young irrigated leys. We find S.22 and S.23 ryegrass, and S.170 tall fescue are the most successful grasses, although S.22 suffered severely from frost last winter. A small acreage of meadow fescue and timothy follows on conveniently.

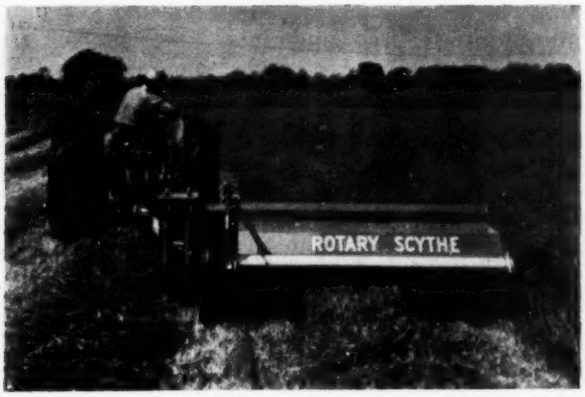
Maize silage complements to a ley system well, since it is possible to get a ley silage crop of say 5 tons to the acre before 1st May, after which date the maize can be sown.

The full cost of growing an acre of maize comes to about £35; ensiling about £2 per ton. This compares favourably with grass silage at £2–3 per ton. The average cost of grass silage starch equivalent is £22 per ton, while that of maize silage is £18. I find that cattle do better in yards on maize silage than on grass silage.

Harvesting in 18–24 hours

It is important that grass and maize crops should be harvested at the right stage of growth, and that, once started, harvesting should continue as quickly as possible until the tower has been completely filled. Grass is wilted by using a rotor scythe which cuts and crimps at about 5 acres per hour. A useful rough test is to collect some of the material and squeeze it in the palm of the hand for thirty seconds; if it springs apart quickly when released, the crop is then fit for harvesting. The dry matter is approximately 50–70 per cent. The crop is picked up, chopped and blown into a self-unloading lorry or trailer and then blown into the tower by an electrically-operated blower.

Normally it would be cut and crimped between four and five o'clock one afternoon, and harvested between eleven and five o'clock the next day. On this basis one tower, containing approximately 300 tons, should be filled in



The rotor scythe cuts and crimps the grass, leaving it ready for collection by the forage harvester

7 to 10 days. When the tower is filled a plastic cover is placed over the crop to seal it until it is required for feeding.

Mechanized feeding

The high dry matter silage is fed from the tower silos, which are of different makes and constructed of different materials. In ordinary clamps and unsealed structures, it is found that as much as 30 per cent may be lost during storage, but in these tower silos the total loss of crops, at almost any moisture content, is not more than about 4–5 per cent.

Double-auger-style top unloaders are fitted in the silos. The unloader itself is worked by an electrically-operated winch which controls the height of the unloader, gradually lowering it on to the face of the silage. The whole operation is governed by a time switch, the augers coming into operation in order of priority. It is important that the concentrates, normally consisting of 3–8 lb per head per day of rolled barley, are added and mixed with the silage. Mineral salt should also be given. The barley, which is stored in the Harvestore, is fed into an American-type roller mill capable of processing 400 bushels an hour, and from there it is delivered to a hopper for adding to the silage. The silage should be fed liberally; the cattle must never be hungry, and yet it is important not to feed too much so that there is risk of silage being left in the mangers.

The majority of the animals will be sold on a deadweight basis during March, April and May, and will, except for one or two, be Grade A. Special premium contracts can be obtained for the standard type of animal. Those going to market are selected a day or two before dispatch but are not taken out of the yard until they are due to leave. It is important to keep a check on economic feeding. Both food and cattle must be weighed, and the food cost should not be more than 1*s*. for every lb of liveweight gain. The cattle should have a constant supply of water, preferably from bowls, and it should be slightly warmed in cold weather.

Cattle and hen manure

I estimate that each animal produces about 4 gallons of manure per day, and every 100 hens about 6 gallons. The storage tank, holding about 22,000 gallons, is divided into two. Because of the bits of chopped silage and feathers which go into the first tank, I have installed a sewage mincing pump. This can first be used for circulating the contents of tank No. 1, and when it has been well stirred, it will then pump the mixed and chopped-up material into tank No. 2. From here it is pumped into the irrigating pipes, some of which are underground PVC and others above ground portable aluminium, so that every field on the farm can be treated. The mains are of 4-inch diameter and the laterals 3-inch.

During the hard weather last winter we had difficulty with the tanks freezing, and although we didn't have one day in which this prevented spraying, it does seem to call for some form of low frequency electric wiring or immersion heater worked on a thermostat, so that freezing can be prevented. The tank is emptied once every three days on average.

All rainwater from the roofs and yards should be directed away from the storage tank and the only additional water should be that which is used for washing down the yards.

Although the value of the manure is considerable, it is not, of course, as high as that obtainable from bag fertilizers. True, it contains nitrogen, phosphate and potash, but there are other constituents consisting of uneaten or incompletely digested feeds, such as barley meal and silage, in which the nitrogen is in an unavoidable form. Much of the nitrogen is also lost in storage.

The storage tanks, set at a lower level than the cattle yards, should not be too far distant; also they should be near a cheap, fresh water supply, which in my case is the river about 50 yards away. The water can then be irrigated via the storage tank or direct to the fields.

Peter Carlton Oldfield, O.B.E., M.A.(Agric.) Oxon., F.A.I., is a partner in the well-known firm of Knight, Frank and Rutley. He is also a farmer in his own right and has specialized in the production of beef both at home and abroad, visiting France, Italy, Switzerland, Yugoslavia and the U.S.A.

More home-grown wheat could be used in bread-making if the protein content were higher

says **E. N. GREER**
of the
Cereals Research Station, St. Albans, Herts

Wheat for Bread-making

ABOUT half the English wheat crop is sold for flour milling. It is almost the only ingredient of biscuit flour and it is a major part of household flours, but only about 20 per cent goes into bread flour. I believe it is worth considering how home-grown wheat can be made more attractive for this purpose. This subject has been discussed often enough, but advances in wheat breeding and farming techniques may now give it a slightly different aspect.

The sort of specification that a British bread flour requires can, very simply, rest on two points. First, it must have a protein content of 11 per cent or more, which means that the wheat mixture from which it is made must average 12 per cent. Second, it needs protein usually known as 'strong'. This is a varietal property best defined as 'capacity for making large and well-formed loaves'.

Apart from this it is only necessary to say that, like other types, bread flour needs to be made from clean wheat, free from the kind of damage that can arise from faulty harvesting or imperfect storage.

Variation in protein

The range of protein content in English wheat is wide; few samples contain less than 7 per cent and a few more than 14 per cent, but between these limits there is something like a normal distribution. The variety trials carried out widely every year by the National Institute of Agricultural Botany can be used to give information about this. The grain from these trials is examined at the Cereals Research Station.

A measure of the variation in protein content caused by change in environment is seen from the averages for the different stations. If the averages for each variety at all stations are compared, this gives an estimate of change due to variety alone. By contrasting two seasons (e.g., 1959 and 1962), a suggestion of annual difference is obtained; while comparison of the means for winter and spring trials gives an idea of the effect of sowing time. Thus:

Protein contents of wheat from N.I.A.B. trials

	General Mean per cent	*Station Average all Varieties*		*Varietal Averages all Stations*	
		Maximum	*Minimum*	*Maximum*	*Minimum*
Winter 1959	9·7	12·3	8·1	10·4	8·7
Spring 1959	10·2	12·5	9·2	10·6	9·5
Winter 1962	8·9	11·8	7·8	9·7	8·1
Spring 1962	10·1	12·0	7·9	10·8	9·4

Suggestions Emerging:

Environment can give rise to protein differences of more than 4 per cent.
Varietal differences are unlikely to exceed 1·5 per cent.
Spring wheat is likely to be higher in protein than winter wheat, on average by more than 1 per cent.
Seasonal differences are unlikely to exceed 1 per cent.

The next table shows with what frequency different protein contents occurred in 1959 and 1962.

Percentage of samples in different protein groups

Amount of Protein	*1959*		*1962*	
	Winter	*Spring*	*Winter*	*Spring*
Below 8 per cent	6·2	1·5	9·2	8·2
8-10 per cent	61·8	53·1	65·8	41·7
10-12 per cent	26·5	38·9	24·4	41·8
Above 12 per cent	5·5	6·5	0·8	8·3

This table adds the information that at present less than a third of the English winter wheat crop contains more than 10 per cent protein, and less than half the spring-sown crop reaches this level.

Of the various methods by which protein content might be improved, suitable top dressing seems the most practicable. Early top dressings with nitrogen fertilizers have very little effect on the protein of winter-sown crops, but nitrogen applied when the crop is heading is effective and, on

average, can raise the protein level in the grain by 2 per cent. Aerial treatment of the crop, and the availability of suitable fertilizers such as urea, make this a practicable suggestion.

Choice of bread wheats

Bread flour needs so-called 'strong' wheat, but it has to be admitted at once that whatever the 'strength' of a wheat variety, it has little chance of being grown on any worthwhile scale unless it is very close to the maximum in regard to yielding ability. At present nearly 80 per cent of all the winter wheat sown is of the variety Cappelle Desprez and more than half the spring wheat is Jufy.

The Recommended List of the N.I.A.B. contains one variety, Elite Lepeuple, which has better bread-making quality than Cappelle; the List may soon include the hybrid TB. 106/40, which has an even better bread-making performance. Both come near to Cappelle in yield (on average some 2 per cent below it). So far as spring wheats are concerned, Svenno is clearly the strongest of all the home-grown varieties but can scarcely match Jufy in yield. On the other hand the new variety Opal has not only promising milling and bread-making quality, but is said to exceed Jufy in its yield.

Relative merits of varieties as bread wheats

Baking tests are still the most reliable method of comparing varieties for bread-making quality. A convenient way of expressing the results of such tests is the so-called 'score', obtained by giving a nominal value to various characters of the loaves (size, appearance, crumb softness, etc.). In the following table scores, out of a maximum of 50, are averaged for the winter and spring varieties already mentioned. On this scale present-day bread flour would give bread which would score 40 or more.

Variety	*No. of Samples*	*Average Loaf Score*
Cappelle Desprez	37	15
Elite Lepeuple	13	22
TB. 106/40	10	28
Jufy I	18	16
Svenno	13	35
Opal	14	22

A greater proportion of home-grown wheat would certainly be used for bread flour if protein type was improved and the average protein content increased. Naturally the choice of particular varieties for bread flour and the necessary increase in protein content would be a little more costly for the farmer, and would therefore be attempted only if there is a reasonable chance of his recouping himself in the increased value of the grain. To that end it would only be prudent to ascertain from likely wheat buyers what would be their attitude to efforts aimed at improving the quality of wheat grown for bread flour milling.

Nearly a quarter of Britain's total glass area is within the boundaries of the Lea Valley. What is the future of this localized industry viewed against inflated land values?

Lea Valley Glass

Will the industry survive?

Ron Gardner

To generations of horticulturists 'Lea Valley' has meant almost everything connected with the skilful and large-scale production of the majority of crops produced under glass; for the products of the Lea Valley glasshouses are nothing if not diverse. Estimates of the gross annual value of the output vary, but it is probably about £8–9 million.

But the industry is now under a cloud, and the reasons for pessimistic speculation are numerous and varied. First, there is the pressure of urban development, leading to demolition of glasshouses and the sale of nursery sites. This pressure has been increasing steadily since about 1950, and recent talk of the possibility of relaxing 'green belt' boundary lines has focused attention on this aspect of the problem. Other adverse factors quoted include competition for labour from light industry and an inability or unwillingness to modernize and re-equip. Atmospheric pollution, resulting in reduced sunlight, is also alleged. And, lastly, there is competition from greatly expanded glasshouse industries overseas, especially Holland.

In retrospect

It all began in the 1850s, with the result that the Lea Valley shares, with Guernsey and Worthing, the distinction of being both the oldest and the original concentrations of commercial glasshouse establishments in the world. For several decades the Lea Valley was also the world's largest. Today, even after thirteen years' contraction, it is still by far the largest in Britain.

It began undoubtedly to serve the ordinary Londoner with the more exotic fruits, flowers and salad vegetables which the rich already enjoyed from their private gardens—grapes, peaches and cucumbers in particular.

The first nurseries were established by the forebears of some of the present families of growers in places such as Tottenham and Finchley—at that time townships on the fringes of London. Later, in 1872, nurseries appeared in Edmonton. And by 1882 Mr. Joseph Rochford, the founder of what has become the largest nursery firm in the country, was erecting the first commercial glasshouses in the parish of Cheshunt. After 1885 development extended northward to Hoddesdon and still later to places such as Waltham Abbey on the Essex side of the river.

Sixty years

In terms of expansion the Lea Valley industry's Golden Age began in 1890 and may be said to have lasted until 1950, a span of sixty years. During that period new construction always exceeded demolitions. Cheshunt, only 17 miles from Charing Cross, was, and still is, the geographical hub of the Lea Valley glasshouse industry.

At present the Lea Valley glasshouse area comprises about fourteen parishes, covering a length of about 12 miles from Edmonton in the south to Ware in the north, and some eight miles from east to west.

By the late 1940s the total acreage in these and a few nearby parishes, the Greater Lea Valley, was computed at about 1,200 out of an England and Wales total of some 4,500 acres. By July 1962, due largely to demolition (but partly to changes in the method of census), the acreage had shrunk to about 720, compared with a national total of 3,783. The rate of decline can be judged from the official census figures for the eight parishes actually bordering the Lea Valley for July in each of the years 1960–62: 1960—774, 1961—756, 1962—719.

Reasons for the decline

The reasons for each closure cannot easily be ascertained, but a survey would show that very few occurred on sites in the 'green belt'. But clearance was rapid where sites were already zoned for housing or industrial development. This is not surprising. In 1959 the average price in the Lea Valley of land sold for housing, or for industrial development, was about £4–5,000 per acre. By the end of 1962 values of £8–10,000 were being mentioned, and prices still seem to be rising. Thus whether the nursery happens to be owner-occupied or rented, there are very strong monetary pressures to withdraw and demolish wherever land use regulations permit.

Two other factors are also worthy of note. At least prior to the current talk of re-zoning for land use purposes, land within the 'green belt' was usually valued at only a few hundred pounds per acre. Secondly, nurseries are very infrequently offered as vacant, either for sale or to let. From this it seems fair to deduce that the most potent factor in the decline of the glasshouse

acreage in the Lea Valley is the pull of land values and not low levels of profitability.

Local views and opinions differ, depending very much upon individual circumstances. There are those who consider that the extension of urban development is the natural order of things and good for the evolution of the industry. In years past, when similar development swallowed nurseries at the London end of the Valley, the proceeds of sale were used to leap frog outwards, on to fresh fields in open country, in parishes such as Nazeing and Roydon. In that way old glass could be replaced by new and the dynamism of the family business maintained.

Even so, in the process of sale and removal, old glasshouse structures, where sound, were, and still frequently are, sold for removal and re-erection elsewhere. It is this which is responsible for the relatively small decline in the national glasshouse acreage, despite demolition in other main centres such as Worthing, Swanley and Uxbridge, as well as in the Lea Valley. Suitable new sites at the northern end of the Valley are now very hard to find. Hence, transfers, when they occur, are usually to the southern counties or to other inland locations considered to be suitable, such as parts of Bedfordshire and south-east Essex.

Cucumber now the basic crop

The question of alternative sites to the Lea Valley has been the subject of much discussion. The Lea Valley, despite much that has been written to the contrary, has certain natural advantages. It is relatively wide and shallow, with marked absence of wind; and this, in addition to minimizing heat loss from the glasshouse, enables mildew-sensitive crops such as cucumbers and roses to be ventilated without the fear of sudden temperature fluctuations which lead to attacks of powdery mildew. Such troubles are prone to occur on more exposed sites and especially near the coast.

On the other hand, the lack of air turbulence in a river valley leads to the formation of cloud and mist, and to a reduction in the amount of sunlight falling on the plants. This is particularly unfavourable for fruit crops such as tomatoes, where yield is very closely correlated with light and the plants seem to enjoy abundant ventilation.

It is, therefore, by a shrewd choice of management on the part of the Lea Valley growers that the proportion of the glasshouse acreage devoted to cucumbers has been rising steadily, while that for tomatoes has fallen. In fact, the economy of the Lea Valley industry is now based on the cucumber.

What of the future?

From now onwards the trend of events will depend increasingly on whether or not the 'green belt' boundaries are pushed back. This assumption does not belittle the problems which beset growers such as those of labour, modernization and foreign competition. This is the obvious deduction to be drawn from the events of the last twelve years. While some further contraction of acreage seems inevitable, the extent depending upon land use policy, it is also likely that a sizeable glasshouse industry will remain here for some years yet. If this is to be so, and if the growers are to enjoy fair prosperity, certain lines of action requiring faith and courage on the part of those who remain will have to be initiated. These relate to problems of both production and marketing. In some respects, fortunately, the omens are promising.

From the marketing angle things are already on the move. Plans have been formulated for the development of a new market which will be grower-controlled; Messrs. Nursery Trades, the existing growers' trading organization, are the initiators of the scheme. Close co-operation with other organizations of like aims and operating in the field of horticultural marketing seems likely.

Need to modernize equipment

Not all of horticulture's troubles stem from defects in the mechanics of marketing. Growers appreciate the need to improve marketing, but any plans for better marketing, including the bulking of supplies consistently conforming to specified grades, and produced on time, are very largely dependent upon efficiency of production. This is true in respect of both the product as such and of the need to produce at a competitive price. Productionwise, the main hindrance continues to be the failure to modernize glasshouse equipment. This applies especially to nursery heating systems, where the change from low efficiency hand-fired anthracite fuelled units to automatically controlled oil or solid fuelled units has lagged behind the efforts of overseas competitors. Likewise, most glasshouse ventilators are still hand controlled, and many acres of cucumbers and tomatoes continue to be watered by hand from hose-pipes. Since 1950 glasshouse growers in other West European countries have made great strides with automation, and if competition from them is to be met and the problems of labour scarcity and competitive rates of pay at home are to be surmounted, modernization and re-equipment must be pushed through in Britain too.

Is glasshouse horticulture finished?

It may be asked whether competition from outdoor producers in warm southern countries may not seal the doom of glasshouse growers in north-west Europe? It seems highly unlikely. Recent developments in glasshouse science and technology suggest that production techniques under glass can be so adjusted that the yields and quality of products will greatly exceed anything that can be achieved in the open.

Glasshouse production and mangement techniques are moving steadily towards those employed in the manufacturing industries, and by that means the power to compete will be maintained.

THE AUTHOR, who has been Director of the Lea Valley Experimental Husbandry Station for 4½ years. In August he was transferred to N.A.A.S. Headquarters on promotion, to become Assistant to the Senior Advisory Officer (Horticulture).

Bert Grueneberg

The success story of two brothers, refugees from Nazi Germany, who now farm over 1,400 acres. Per ardua . . . .

The Grueneberg Way

Adolf Grueneberg

A. H. VERNON

THE story of the two Grueneberg brothers, Adolf and Bert, must surely be one of the most remarkable. It begins in Germany, where they were born, and until 1939 owned and farmed a 300-acre dairy farm. Under Nazi rule, however, they were forced to flee that year almost overnight, their farm and all their belongings being confiscated. They arrived in England with just the clothes they stood up in, a few odds and ends they had been able to snatch before leaving, and about 20 Marks; and to add to their difficulties they knew little of the English language.

In January, 1940, they obtained jobs as joint cowmen on the 1,000-acre Manor Farm, Winterbourne Monkton, near Swindon, at a weekly wage of £2 each. By hard work and spending little, they managed to save something, and by borrowing a little more were able to buy 10 acres of land in the village. This enabled them to get their feet on the bottom rung of the ladder and start as farmers in their own right. On this smallholding they managed to milk 20 cows, doing all the work in addition to their duties as cowmen on Manor Farm.

First step up

In 1942 Manor Farm was bought by Mr. F. C. Carr, who owned several farms in the district. He was to prove a good friend to the brothers. He offered them the tenancy of Mill Farm, Bulkington, near Devizes, and by selling their 10-acre smallholding they were able to amass enough capital to put down a deposit for the rent on this 180-acre dairy farm. The Gruenebergs never believe in doing things by halves; after a few months they were milking 100 cows. And by working a 15½-hour day—from 2.30 a.m. until 6 p.m.—they were able to cope with all the work on this farm without employing labour.

For the next five years they farmed Mill Farm, managing to put by a considerable amount of money; indeed, they had little time in which to spend any! They were now half-way up the farming ladder.

The war over, in 1947 Mr. Carr offered them the tenancy of the 1,000-acre Manor Farm, and so, after starting only seven years previously as £2 per week cowmen on the same farm, they had risen to be big farmers in this area of big farming.

Return to Manor Farm—as tenants

They started at Manor Farm with about 200 cows and 200 acres of corn. But gradually the cows were increased, until by about 1955 the number had reached 400 and the highest daily milk production 1,300 gallons. In winter every conceivable building on the farm was filled with cows, and indeed my impression of the first visit I paid to the farm is one of not being able to approach the gate because of the milk churns!

Not content with one farm milking 400 cows, the Grueneberg brothers took the tenancies of two more farms in the late 'fifties—Priory Farm, Axford, near Marlborough (180 acres and a herd of 80 cows) and Gorton Manor Farm, near Calne (260 acres and 115 cows). Thus the total number of cows which they owned at one time approached 600. It would probably be true to say that they were then producing more milk than any other farmer in Wiltshire—and that is saying something! The top of the ladder had been reached.

Switch from milk to beef

It is not surprising that by 1960 the strain had begun to tell. The Gruenebergs decided to evolve a plan which would impose less work and worry. They gave up milk production on Manor Farm, increased the corn acreage to around 800, and started a beef enterprise. Milking continued on the other two farms.

Manor Farm lies on the lower chalk. The soil is a fairly heavy chalky loam, well suited to wheat or barley, and the majority of the fields had been in grass for a number of years, so the fertility was good.

This switch to corn and beef has not incurred any great expenditure on buildings, except to install a grain drier and storage bins for 500 tons of grain. But anybody visiting the farm today is struck by the huge number of cattle in the yards. After their first annual farm cattle sale in January this year, when 1,000 head of store and fat cattle averaged just over £50 a head, the brothers bought 450 Irish stores which were fattened on a ration of soaked sugar beet pulp, barley straw, and fattening concentrate and sold in

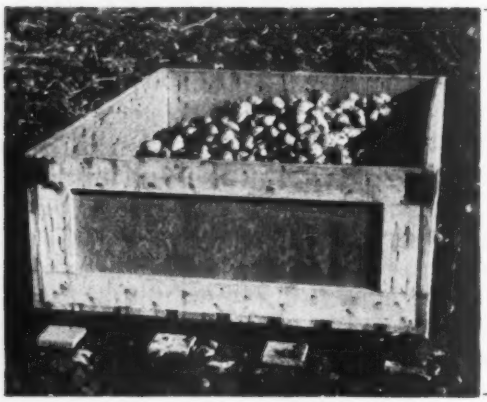
May with other cattle. This has made way for the calves now being reared, as the main scheme for producing young beef gets under way.

Calves for young beef are bought at local markets, preferably from the dairy ring. Most of them are beef cross calves, but there are also some Friesians. The calves are suckled on nurse cows for a fortnight and then bucket fed on milk substitute until three months old. The idea is to produce fat cattle of 8½–9 cwt at about 14 months, using home-grown barley as the basis of the ration.

It is difficult to assess the difference in the financial results under the new system, but the brothers are now able to lead a slightly less arduous life as they grow older.

Timber and plywood potato pallet bins

for quicker picking and easier handling from field to store



40 in. × 48 in. Internal depth: 24 in. complying with B.S. 2629 : 1960.

Trials held by the Timber Research and Development Association are reported in a new publication free on application to the Association, St. John's Road, Tylers Green, High Wycombe, Bucks.

8. West Carmarthenshire

N. Daley

WEST Carmarthenshire comprises some 50,000 acres of unspoilt countryside which, devoid of the scars of heavy industry, presents to the visitor a panorama of green fields and whitewashed farm buildings.

The area lies between the River Towy, south of Carmarthen, and the Pembrokeshire border in the west. To the south it is bounded by the coast of Carmarthen Bay, the haunt of thousands of holidaymakers. The seven miles of Pendine sands, once used for motor racing, have now adopted a more sinister role as a testing ground for military weapons. The northern boundary is not so well-defined, but follows a line roughly parallel to the main Carmarthen—Whitland road.

The district ranges in altitude from sea level to 600 feet, and is dissected by numerous small valleys, many of which are left in woodland of varying types. Consequently almost every farm has an acreage of steep and difficult land. Most of the district is drained by the River Taf and its tributaries, and the river splits the area into two, being first bridged at St. Clears, seven miles from the sea and in mediaeval times a flourishing port.

There is a general correlation between soil types and parent rock, the outstanding feature being a band of Old Red Sandstone in the south. Here the soils are well drained and easily cultivated, and are the best in the district for producing crops. Further north the sandstone merges into the Ordovician and Silurian shales of North Carmarthenshire. Pockets of boulder clay are distributed widely throughout the district and give rise to localized areas of impeded drainage and low fertility. Alluvial soils are found quite extensively along the valleys of the River Taf and its tributaries, providing some excellent summer grazing pastures.

Climate is the most important of all the physical factors influencing agriculture in West Carmarthenshire. The average annual rainfall of 50—60 inches is spread fairly evenly throughout the year, but the lack of fine days is of more significance than the total rainfall. The rain has the advantage of promoting a good growth of grass, but it can make hay and corn harvesting very trying operations. Winters are relatively mild, allowing stock to be outwintered on the drier land and early potatoes to be grown near the coast. Late autumn and early spring grazing help to shorten the winter feeding period.

The only industry in the area serves the needs of agriculture. There are milk factories at Carmarthen, St. Clears and Whitland, the last-named with a capacity of 120,000 gallons daily, being amongst the largest in the world.

Of historical interest is the township of Laugharne, which occupies a unique place in the history of the Boroughs of Britain. Laugharne escaped the borough reforms of the nineteenth century and still retains its Portreeve-Mayor, a recorder, two common attorneys, a bailiff and a jury. These now function mainly for settling disputes about 'burgages' (land holdings). The burgesses of Laugharne hold their land in the mediaeval manner of manorial strips, and these strips are found in three fields, exactly as they were 400 years ago.

The district is one of small farms—over half the holdings are under 50 acres—depending on family labour, with only a few of the larger farms employing one or two regular workers. These larger holdings are found mainly on the sandstone soils to the west of the River Taf, where barley and early potatoes have become popular in recent years as cash crops.

Most of the farmers are now owner-occupiers, and there is only one flourishing estate left in the district. Rents still lag behind those in other parts, averaging only £2–£3 per acre, and many landlords are unwilling or unable to improve fixed equipment.

Dairy farming is the main enterprise on the majority of holdings, the black-and-white cow being the dominating breed. The small Welsh farmer is truly 'tied to the cows' tail'. By tradition, most of the cows are wintered in cowsheds, with a staple diet of hay, supplemented by the liberal use of bought concentrates. Self-fed silage and milking parlours are gaining in popularity, lowering feed costs and taking much of the drudgery out of winter milk production. Beef and sheep production are of minor importance, although there is scope for sheep on many farms and the benefits of their grazing would be most welcome.

Pigs and poultry are not in favour as sidelines, even on the smallest dairy farm. Poultry numbers continue to decline, and pigs come and go with every fluctuation in market prices.

Most of the acreage consists of permanent grass, but on many of the farms it is customary to plough a small area for kale each year and follow it with reseeding. Grassland management generally is based on tradition, with the same hay and grazing pastures being retained each year. Farmyard manure, lime and slag as the main fertilizers are the rule, but the increased use of complete fertilizer is spreading rapidly. Grassland has great potential in such a high rainfall district, and properly managed, meat and milk can be produced very cheaply.

The chief problems in the area are those of limited acreage, a declining labour force, and a traditional reluctance to use borrowed capital for expansion. Although costs are kept to a minimum, total output is often too small to provide more than a living, with little or no reward for management and return on capital. Tradition is perhaps one of the greatest barriers to progress, and new techniques are only accepted slowly, and frequently with suspicion.

Increases in income are being achieved by intensification, introduction of subsidiary enterprises and improved conservation to reduce the winter feed bill. Perhaps the future will see other ways of increasing viability—amalgamation or the smaller holdings forming into groups.

The Ministry's Publications

Since the list published in the August, 1963, issue of *Agriculture* (p. 396) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government bookshops (addresses on p. 456), from Divisional Offices of the Ministry or through any bookseller at the price quoted.

BULLETINS

No. 193. **Pig Feeding and Management** (New) 5*s.* 6*d.* (by post 5*s.* 11*d.*)

Farmers and others concerned with the bacon and pork trade will be interested in this new bulletin, which is largely the work of Dr. W. E. Coey, an authority on pig husbandry. Guidance is given on capital expenditure, selection of stock for breeding, types of farrowing accommodation, finishing and many other points of interest. Curers, traders and butchers, whose aim it is to please the critical consumer, will also find information of considerable value in this illustrated handbook.

LEAFLETS

Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 6d.)

ADVISORY LEAFLETS

No. 241. Leaf Spot of Celery (Revised)
No. 522. Black Grass (New)
No. 523. Diseases of Turkeys (New)

HORTICULTURAL MACHINERY LEAFLET

No. 8. Handling Unit Loads (New) 6*d.* (by post 9*d.*)

OTHER PUBLICATIONS

N.A.A.S. Quarterly Review No. 60. Summer 1963 (New) 2*s.* (by post 2*s.* 4*d.*)

FREE ISSUES

Obtainable only from the Ministry (Publications), Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex.

Fire Prevention on Farms (Revised)

J. N. ADDISON
Agricultural Land Service,
Newcastle-upon-Tyne

A Change of Emphasis

WHEN the owner-occupiers took possession of Stelling Farm (238 acres) in May, 1960, it was a traditional type of Northumberland farm. The slate-roofed stone buildings, which had been designed to accommodate unthreshed corn, hay and cattle for a larger acreage, were in good condition, providing accommodation for 50 cattle in three different byres. There were also the necessary other buildings for a rearing farm of some 350 acres. The new intention was to farm the land primarily as a dairy enterprise, plus some stock rearing.

Before this change of emphasis could take place, accommodation had to be made for a milking herd. The requirements were that the herd should be capable of management by one man, that a bull and dairy followers would be kept and that the main bulk feed would be silage. The obvious answer seemed to be loose housing, with parlour milking and self-feed silage. But did this really fit the circumstances?

The buildings after conversion, showing the dairy and the covered yard for young stock

Elevator to mechanical cleaner

There was a cross fall of 12 feet over the site of the homestead and putting up new buildings would be very expensive. It was clear that the existing buildings would have to be incorporated into any new scheme. The various methods of feeding large quantities of bulk food had also to be considered; and the wastage associated with self-feed and the daily cleaning out of byres compared with the removal of slurry from concrete areas.

The owners' needs have been met by the conversion and enlargement of an existing feeding byre to a double-range byre for 44 cows. An existing cover over a yard and loose boxes beside the byre were pulled down, and this enabled the area to be covered with a prefabricated building, forming a centre driveway with mangers. Two yards on each side provided accommodation for 64 young stock.

After removal of the first floor and part ground floor, the barn was converted into a silo with straw store over, and the mill adjoining the barn is now a store for shavings and sawdust. A bull box, exercise yard and calf-pens have been erected from existing buildings on the west side of the new byre, and accommodation provided for dry cows and four boxes (originally the stable) on the east side of the new yard. The covered area at the south end of the byre was made into the office and dairy.

The retention of the byre system was deliberate. There may be some surprise that a steading should be modernized to include a cow byre as part of the plan in an area where straw is not scarce. But one of the buildings with a slated and boarded roof readily lent itself to such a conversion and was most conveniently situated. The cows are bedded on shavings and sawdust, and there is no washing down of the centre walk. Instead, ground limestone is brushed on daily. A mechanical cleaner of a continuous type has been installed which, at the press of a button, delivers the dung in the channel to the waiting spreader—an operation that takes only ten minutes. With no water on the floor and adequate ventilation, condensation is not apparent and the cows appear to be very comfortable in an air temperature of 50–55°F when it's freezing outside. Milking is done by one man operating four units direct to churn and thence to the dairy and bulk tank.

The conversion gives accommodation for 150 stock with their food and bedding under one roof and illustrates the benefit of careful planning of a steading as a whole for easier management and economy of labour.

No doubt any farmer walking round in the comfort of his byre in carpet slippers must, as he presses the button of the channel cleaner, think of his neighbour pushing slurry to the pit. Meanwhile, the neighbour is thinking of slurry effluent and wonders will the next knock on the door be the man from the River Board.

IN BRIEF

Bovine Mastitis

It is believed that there is more mastitis in our herds today than there was twenty years ago—and that notwithstanding the wide use of antibiotics. The recent report *Antibiotics in Milk in Great Britain* has refocused attention on this problem, and we ask ourselves why this increase should be so.

There are a number of explanations. Cows are giving much more milk and therefore the udders are presumably more susceptible to injury and disease. Modern methods of cleaning and sterilizing milking machines, although less expensive than heat, are not always so efficient. And, indeed, the now almost exclusive use of the machine for milking is itself considered to be a factor in increasing the prevalence of mastitis.

As each case of clinical mastitis has occurred, there has been extensive use of antibiotics, but experience has shown that this alone is not an effective way of combating the disease.

Obviously clinical cases must be treated, but their occurrence is, in most instances, a visible warning that there is sub-clinical infection in the herd, most of which is not apparent even on careful inspection of the fore-milk cup. About 25 per cent of our cows are affected with sub-clinical mastitis, and it has been calculated that this causes a 10 per cent reduction in the milk yield of each affected cow. Cows which have been treated for mastitis are still susceptible to re-infection, and so treatment of each case as it occurs can have only a temporary benefit for that particular cow; it will do nothing for the herd as a whole.

To control mastitis, three basic facts must be appreciated: (1) that mastitis is caused by a wide variety of organisms and that most of them get into the udder via the teat-canals; (2) that infection is passed from cow to cow mainly by the milker's hands, the udder-cloths and teat-clusters; and (3) that many of these organisms can live on the skin of the udder and teats for a very long time, so acting as a source of infection.

To prevent the spread of infection from cow to cow, milkers' hands should be dipped in disinfectant before going on to a fresh cow. Individual sterile udder cloths or disposable paper towels should be used for washing the udder with a disinfectant which is capable of controlling the infection on the skin. The teat clusters are best disinfected after milking each cow by running water through the clusters, including the long milk-tube, using either cold water for 15 seconds or hot water (185° F) for six seconds.

Inevitably there will still be sporadic cases of mastitis, and antibiotics have their place in the treatment of such outbreaks, but if the spread of infection is controlled by strict attention to hygiene and the cows are milked properly with an efficient milking machine, then the number of such cases will drop considerably.

The report mentioned is on sale at H.M.S.O., price 1*s.* 3*d.* (by post 1*s.* 6*d.*)

Grass waiting to earn a profit

So often permanent grass is just 'room out of doors'; and in England and Wales there is some 12 million acres of it—about half the total cultivatable land! On this basis alone permanent grass is an important crop, but it is also important in its own right in terms of potential production. But not until recently has it received the attention it deserves.

The wide publicity given to the merits of temporary grass, has by implication at least, suggested that permanent grass was of much less value—almost an anachronism. But the most important thing wrong with permanent grass has been the bad management which it generally has had. Perhaps in the majority of cases it was just taken for granted, having cost nothing to establish.

Given the same treatment, permanent grass can be as productive and at least as profitable as temporary grass. And when results of this order are achieved permanent grass is by far the cheaper grass.

Where the sward is well established, all that is needed to allow it to achieve its potential is good management including adequate fertilizer treatment. While lime, phosphate and potash may be necessary, nitrogen is the plant food which plays the decisive part. Permanent grass will respond to quite heavy dressings of nitrogen—an important point often overlooked. Equally important are proper stocking and good management of the grazing. As a rule all these points are given careful consideration in connection with temporary grass, but how seldom does permanent grass receive the same kind of consideration!

Many farmers have pushed up the productivity of their permanent grass at relatively small cost—certainly at small cost by comparison with ploughing and reseeding. And it must be borne in mind that to plough and reseed implies that the operation will probably have to be repeated from time to time, thus making it a high cost system.

The new grassland renovation scheme, recently approved by Parliament, came into operation on 1st September. Under it farmers are offered a grant of £4 an acre for renovating grassland which is at least seven years old and which requires—and is likely to respond to—a thorough-going programme of surface treatment.

W. S. Rayfield

Potato root Eelworm and Dazomet

It is, at present, expensive to use chemical soil sterilants to kill potato root eelworm in field soils where crop rotation may avoid trouble. In glasshouses, however, where tomatoes are also attacked, it is profitable to sterilize the soil each year before planting.

Dr. J. E. Peachey, in a joint experiment with N.A.A.S. entomologists, found that dazomet dust, at $\frac{3}{4}$ lb per 100 sq. ft applied to the soil surface and thoroughly mixed in, killed more potato root eelworm than other chemicals tested in seven glasshouses used for growing tomatoes. Dazomet decomposes in contact with soil moisture, and the soil surface must be rolled and sealed with water to assist production and retention of the toxic gas. Experiments at Woburn Experimental Farm showed that metham-sodium and methyl isothiocyanate were also efficient, especially if the former is diluted and mixed into the soil.

Further thoughts on Free-standing Partitions

In the June issue of *Agriculture*, Mr. Richard Wellesley of Faringdon, Berkshire, described a simple movable wooden partition which he is using to separate stored grain.

Dr. I. Thomas, Director of the Ministry's Infestation Control Laboratory, has suggested that there may be difficulties here in preventing and controlling insect invasion and that cats do not have a place in the control of rodents in modern grain stores. From their experience, grain is likely to penetrate beneath the partition where there is any unevenness in the floor of the storage building; it may also penetrate the vertical joints between each length, and will certainly fall down from the top into the space between the two layers of plywood, thus providing both food and shelter for grain-infesting insects.

A more satisfactory arrangement would be to close the top edge of the partition and to seal the joints in the same way as is proposed for the joint between the vertical and sloping plywood panels; the vertical joints, too, should be sealed in this way if irregularities in the floor do not make it impracticable. The open ends of the base should also be closed and sealed.

To ensure that the risk of insect infestation is kept to a minimum, the partitions should be dismantled at least once a year, preferably before each harvest, and the space beneath each cleaned, all residues swept up, and the partition itself (including the underside) sprayed with insecticide against insects before re-erection and re-sealing of the joints. The building should be thoroughly cleaned at the same time, and the floors and walls sprayed.

Anemones and Base Fertilizers

The fertilizer requirements of anemones have been under examination at Ellbridge (Cornwall) since 1959. This Experimental Station has been trying to find out the effect of different levels of nitrogen, phosphate and potash applied as base dressings to anemones grown on soils with a high phosphate and potash status.

The results show that on land in good heart little phosphate or potash is required, and nitrogen in the form of hoof-and-horn, if needed at all, should not be applied in excess of 5 cwt/acre. Further investigations into the lower levels of nitrogen required by anemones may be warranted, but many growers who use high levels of compound fertilizers as routine applications for anemones on land in good heart may find it beneficial to reconsider the amount of fertilizer applied to this crop.

The Golden Plough

Ten years ago ploughmen from eleven countries met near Cobourg, Ontario, for the first world ploughing contest. The contest again comes to Canada this year, at Caledon, Ontario, when nineteen countries will be competing for the Esso Golden Plough.

Last year's contest, held in the Netherlands, was won by Hans O. Sylling of Norway. The previous year the championship went to William Dixon of Canada. Will the Canadians be able to recapture it on their home ground?

Books

Crop Protection. G. J. Rose. Leonard Hill. 84*s*.

In this 490-page volume, revised and much enlarged since the 1955 edition, the author's declared aim is to integrate the achievements of the biologist, chemist and engineer in chemical crop protection and make them intelligible to the practical agriculturist, thus enabling farmers and advisers to appreciate the range of chemicals and equipment available and the sort of problems they may help to solve—in tropical as well as temperate climates.

The first four sections cover the choice of formulation appropriate to a particular problem; the properties and uses of some widely-used chemicals; the design and operation of machinery for dusting and spraying crops; and the development and practical application of concentrate spraying.

Sections contributed by other authors deal with herbicides and seed treatments (C. P. Hampson); turf protection (I. Greenfield); stock protection (D. Boocock); and stored product protection (T. W. Barker).

Much useful and interesting information is presented, especially about machinery, yet there are some surprising omissions. Virus diseases do not feature in the index, so there is no direct lead, for instance, to control measures against sugar beet yellows. For wild oat control barban is listed, diallate is not. Methods of dealing with rodents, mites, bacteria and fungi are described in the stored products chapter, but control of insect infestations is completely ignored. Granular formulations are not discussed. Indeed, the omission of many promising new chemicals must restrict the value and useful life of this edition. On herbicides, the British Weed Control Council's Handbook provides much better guidance.

A more serious criticism is that the book's arrangement, primarily by chemicals, makes the information it contains much less readily accessible to farmers than the author hopes. For the farmer, crop protection problems centre on the crop under attack, but remedies for specific crop/pest (or weed, or disease) situations can be found only indirectly via the book's index or an appendix of crop spraying suggestions arranged alphabetically (from African Violets to Wheat).

The fact is that chemical crop protection has become such a vast subject that there are only two ways of putting it clearly to the user: either in encyclopaedic form, or in a series of crop-oriented monographs. Regrettably this volume does neither.

S.L.

Rutland: A Shell Guide. W. G. Hoskins. Faber and Faber. 15*s*.

Rutland has been described as having 'all the charm of the Cotswolds with none of their ostentation'. This little book, the latest in the excellent series of Shell County Guides, has captured the placid and rather leisurely spirit of the county, with its wide skies, rolling countryside and enchanting stone villages. Professor Hoskins has diligently sorted out the choicest corners, and the excellent illustrations do full justice to the text.

The introduction sets the tone for the book and introduces the stranger to the countryside, explaining from history and geology the reasons for its modern pattern of compact villages on the ridge, usually of ironstone, around which are the large open fields typical of the limestone ridge which runs across England from the north-east to the Bristol Channel.

Rutland is essentially an agricultural county, only the cement works at Ketton and the occasional ironstone working disturbing the general impression of rural England as it must have been before the industrial revolution.

A surprising omission is the lack of explanation for the unique collection of horseshoes in Oakham Castle. The castle itself is the finest example of Norman domestic architecture still extant. The agricultural reader may be disappointed by only a passing mention of the county's farming activities, of the famous Welland Valley grazings, and particularly of the important part that sheep have played in its history for some seven hundred years.

There is, however, a whole wealth of information about Rutland in this book, particularly for those interested in buildings, either from an architectural or an historical point of view. The Gazeteer is comprehensive and full of flavour, while the section on the lost villages—based on recent searches—is thorough and stimulating to the amateur local historian.

J.D.L.

Beef on Ranch and Farm. L. T. TRACEY. Oxford University Press. 21*s*.

This is a handbook on beef cattle rearing in Rhodesian and South African conditions, and a very good one it is too. The author's ranching objective is to have a herd of cows which calve every year, produce heavy calves at weaning time and continue to do so for as many years as possible.

Breeds therefore come into the picture. The basic rule is to fit the animals to the environment. The European breeds have not done well in the past, but as standards of nutrition improve, and diseases come under control, the situation may change. But for the present the Africander and its crosses are considered best for most conditions.

The key to improvement, within the confines of environment and economics, lies with better nutrition and better management. The arid conditions of South Africa's veld require very delicate adjustment between pasture growth and stocking rate. The author favours continuous light grazing rather than heavy rotational grazing; or, as U.S. ranchers say, 'eat half and leave half'. During the dry season protein shortage is acute and although cautious in his opinion, Mr. Tracey sees hope in the use of protein salt blocks.

He then proceeds to deal with a wide range of practical management matters. The siting of water holes is obviously important if even grazing is to be secured in large paddocks. So is the use of fire as a means of range improvement. The various methods of ear marking, castration, dehorning and branding are also discussed.

Control of parasites is vital in the cattle economy and considerable detail is given about modern dips, dipping methods and the fixed equipment needed to do the job well. Reference is made to screw worm attack, but there is no mention of the very successful control measures developed in Florida.

The book is an excellent blend of the scientific and practical aspects of beef ranching. *H.E.*

Eley Game Advisory Service Annual Report, 1962-63.

The Annual Report tells of a free Game Advisory Service serving the rather unusual proposition that landowners, farmers and foresters would be well advised to treat game birds as a crop to be reared, tended, fed and harvested in the same way as any other farming crop. For most countrymen this last will need some new thinking; but the more thinking you give the idea the more sense it becomes.

Nor is this thinking by any means confined to the incubation and rearing of young stock. Winter feeding, the provision of nesting sites, the layout and maintenance of coverts, the correct cutting of grass for hay and silage, all can do much to encourage wild stock to breed and reduce natural mortality. And it can be achieved without seriously interfering with farming operations, besides helping to produce more birds for the guns.

As an annual report this book mainly introduces a series of experiments designed to solve problems of interest to the sporting landowner. For those who do not know its work it will also form an admirable introduction to an organization whose job it is to provide a free advisory service, by way of leaflets, lectures and visits to individual properties, for the benefit of the shooting public.

Copies are free from the Eley Game Advisory Service, Fordingbridge, Hants.
M.F.T.

A Guide to Prehistoric Scotland. RICHARD FEACHEM. Batsford. 35*s*.

Practically all who follow their occupations, or their recreations, in the Scottish countryside must know examples of the cairns, standing stones, walled enclosures and other ancient structures that are the subject of this book. Many will have wondered about their age and significance. It is not difficult nowadays to get hold of a readable outline of British prehistory, and the 'mass media' have helped to diffuse the current views. But as regards individual sites, any information that exists may take some time and trouble to track down.

Mr. Feachem provides notes on about eight hundred Scottish monuments. After a general introduction he groups them on a chronological basis, with a short essay on each class (e.g., chambered tombs, hill forts), followed by descriptions of the items in that class arranged by location. Thus Ayrshire, for example, will be dealt with on several widely separated pages, but the bibliography, which gives a source of further information for every monument mentioned, serves also as an index to them by counties, whilst names of sites appear also in the general index. In practice, therefore, the arrangement is a good one. Everyone interested, at whatever level of experience, will be assisted in finding the

monuments and in looking at them with an informed eye.

The reader may find that certain of his favourites are omitted. Exhaustive cover could not be aimed at, certainly not in one easily portable volume. Scotland is very rich in such remains, and is likely to stay so in proportion as they become widely understood and appreciated. Archaeologists do not seek to sterilize all ground that bears traces of the activities of our early forerunners, but they naturally deplore thoughtless destruction of the record, as has often occurred—not all of it in the remote past.

Owners and tenants can do much to prevent or avoid destruction except (where it is essential) under competent supervision, and thus show themselves in favour of scholarship and amenity. They can also report the discovery of any small finds or unrecorded structures that come to light; this happens every year in Scotland. Mr. Feachem and his professional colleagues for their part are aware that to have an object of public interest on one's land is not always a blessing, and he makes a point of discouraging unauthorized access.

A.H.J.

English Landed Society in the Eighteenth Century. G. E. MINGAY. 40*s*.

English Landed Society in the Nineteenth Century. F. M. L. THOMPSON. 45*s*. Routledge and Kegan Paul.

Various aspects of the role of the landed classes in English social history have long attracted the attention of historians. Now, for the first time, that role has been thoroughly explored in full-length works. Dr. Mingay and Dr. Thompson have brought together a vast quantity of published material and have contributed the results of their own extensive researches in this field. Their absorbing accounts of the landowning classes, in their heyday and in their decline, should have a wide appeal; the agriculturally-minded reader will find both books especially rewarding.

'Landed society' is a term that embraces many sorts and conditions of landowning men. It includes the aristocracy with their huge estates, the gentry with more modest but still substantial properties, and the many small owner-occupiers who together owned a substantial proportion of the country's cultivated land. The small men were most numerous in the eighteenth century, and Dr. Mingay does not neglect them. Thereafter, with the growth of the greater estates, their position was gradually weakened, and it is the aristocracy and the gentry with whom Dr. Thompson is primarily concerned.

Though their wealth and influence largely derived from the land, the interests of landlords were wide and sometimes far removed from the soil. They wielded great political power, and they contributed capital and initiative to the development of industry and commerce. Nearer home, county administration was largely in their hands and much of the life of the countryside revolved around their households. Nevertheless it was, of course, agriculture which absorbed much of their energy.

In the eighteenth century, agricultural improvement was in many landowners' minds. Some of the aristocracy were among the improvers, but in general the big landlords were chiefly interested in rents and in estate administration. As far as innovations in husbandry techniques were concerned, the responsibility lay, as Dr. Mingay shows, with some of the country gentlemen managing their own home farms, with some of the larger owner-occupiers, and with the better tenant-farmers. The landlords' chief function in the 'agrarian revolution' was, rather, to provide favourable conditions in which improved farming could develop. They created compact farms, established liberal tenancies, provided good farm facilities, and made capital available to their tenants.

Dr. Thompson carries the story of estate management into the nineteenth century, with a detailed account of the part played by stewards and other estate servants. Some landlords were personally responsible for managing their estates, but the development of a professional managing class was an outstanding feature of this century.

There was, of course, great variety in methods of management. On some estates a single agent supervised the work of subordinate servants; on others, several men had equal responsibility, controlling different parts of the estate or sharing out the various duties. The great estate had an army of subordinate servants, from the specialists in charge of certain operations to the ubiquitous bailiffs keeping a watchful eye on the tenants. On the smaller gentry estates, methods were even more varied and owners frequently played an active part in management.

In the latter part of his book Dr. Thompson examines the changing fortunes of the landed classes from 1790 to 1939. The agricultural activity of landlords was constantly changing to meet new economic and social circumstances. Above all, the

industrial revolution undermined the basis of their power, and the decline of aristocratic influence and the break-up of estates brought an end to their dominance.

K.J.A.

Garden Flowers. R. D. MEIKLE. (The Kew Series). Eyre and Spottiswoode. 30*s*.

Every now and then we are offered a series of books that is really first-class in every way. Nothing in the past twenty or thirty years has been produced to equal the Kew Series, of which the latest volume, *Garden Flowers*, is a worthy addition to its predecessors.

This series of books has been planned, edited and written by members of the Botanical staff of the Royal Botanic Gardens at Kew. Its authority goes without question. All the books in it are greatly acceptable, not only to students and knowledgeable botanists, but also to lovers of Nature who may know very little about the subject.

The volumes follow a general pattern—they are arranged scientifically, and follow the principles of modern systematic botany. With a little careful study of the principles involved, the reader is enabled to track down the plant, and once he has tracked it down he will learn all about its history, origins, and in the present book, the attention it needs to grow to perfection in his own garden.

Garden Flowers describes many hundreds of the plants that we grow in our gardens, with copious illustrations. Indeed, I can think of no book that would be more useful to the ordinary gardener. The Latin names and the common names are given, and there is an excellent glossary which explains in simple language the various technical terms used to describe the parts of a plant or its characteristics.

This is a wonderful book to give as a present, and I would suggest that you start by giving it to yourself first. *R.H.*

Received

Report on Forest Research for the Year ended March, 1962. H.M. Stationery Office, 13*s*.

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General Conditions of Appointment and a statement about the post may be had from the Registrar of the University or from the Secretary, Association of Commonwealth Universities (Branch Office), Marlborough House, Pall Mall, London, S.W.1. The University Calendar may be consulted in the Library of any University which is a member of the A.C.U.

Applications (in duplicate) and giving the information listed in the last paragraph of the general conditions of appointment should be lodged with the Registrar, The University of Adelaide, Adelaide, South Australia, not later than *October 4, 1963.*